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Collection and Field Note Book

No. 60

(March 10, 1961 - March 24, 1961)

(41456 -- 41722)

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Hawaii

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Kaleehaua, Kailua-Hilo,
airport pt.

Washington 25, D.C. USA

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Field note book # 40
beginning with
41456
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Robt. Allerton - Lawai-Kai, Kona
John Wyatt Gregg

1

March 10 - flight from
Honolulu to Kauai. 6⁰⁵ am.

Only about half of the
Ewa Coral Plain forest
still in forest. Refining is
actually on Barber Point.
Some bad erosion, perhaps
bulldozer erosion, on
first of many ridges
coming down bet. Ewa and
Wanabuli.

Kauai - flats on east side
are all in sugar cane
plantations. Mango trees in
gullies. near Lihue.

Kato tells me that there is
forest in Kilohana crater,
that has probably not
had cattle in it.

Also says there is *Pisonia* inermis
at 3500-4000' on Puna Waawaa, Hawaii.
says there seem to be 4
Pisonias in H.P. (2 Cedars, no
with lvs. petiolate, other sessile).

Takimude. Japanese Victor Corp.

samples of heat sent to
Estella Seigold. Is probably
overlain by lava flows. Two layers
separated by clay layer 3'

Gam Patterson - says most of
bauxite areas are under cane or
pasture, with solid growths of
Leucaena bush; a bit under rain forest
and some bauxite under *Lehua Mahoe*
dog. Bauxite developed on old flow slopes.
Knows a place where 2 thick bauxite layers

2 1961 Hawaiian Is.

- Mar. 10 - Round Top, Honolulu
41456 *Bambusa mexicana*
3 established on brushy slope

Mar. 10 Manoa Cliff Trail
in degraded tree forest

- 2 57 *Ficus*
planted
2 58 *Elaeocarpus*
planted
3 59 *Psychotria (stramia) hadiana*
occasional to common
2 60 melast.
3 61 *Psychotria (stramia) mariniana*
common
61a *Psychotria hexandra*
rare

Mar. 11 Head of Kalalau Valley, east of lookout

- 3 62 *Mycrostea*
edge of degraded Metrosideros forest
4 63 *Nertera granadensis var. insularis* (Hib.)
common on ~~heavy~~ clay
banks at roadside in cloud forest
64 *Scaevola*

Mar. 11 - Kalalau Lookout,
head of Kalalau Valley

- 3 64 *Scaevola*
edge of Metrosideros forest
7 65 *Coprosma*
edge of Metrosideros forest back of cliff
3 66 *Gauldia*
edge of cliff in wet forest
(ctd. on 6.14)

Oahu - Kauai 3

280 m

small tree 4 m. tall, a
few ~~leaf~~ leaves with
~~lower leaflets~~ slightly
opposite at base; flowers white.

420 m

stranger, sterile.
tree, sterile.

shrub, fls. white 5-parted.
infl somewhat drooping
sterile shrub.

shrub. fls. white 4-5 parted
infl. stiff.
shrub 1.5 m. tall. sterile.

?900 m. small tree 5 m. tall, sterile;
leaves appearing chlorotic.
very coarse,
prostrate, light green,
fls. yellow, fruit red.

?900 m.

shrub 3 m. tall, evergreen;
fruit black.

shrub 2.5 m. tall,
fruit immature.

shrub 1.5 m. tall; fls. dark purple outside,
green inside.

Mar. 11 Road w. of Lihue
Big ravines with Pandanus
& lowland forest.

Lower slopes of first
range - open Pandanus forest
irregular, patchy.

300 yds n.e. Kukaeo Gap - Kolo Rd. pt.
Just west of here - exposure
of gray clay with bauxite
under a red weathered flow
with bauxite, thin several feet
thick. 30' down is a black
peaty layer. (sample not sent
to Denver). Clays all very deep.
Gray clay is buried swamp clay.

Alpinia speciosa lines
roads in places. *Melastoma*
abundant. Pineapple.

Low ridges wooded with
open woods, with *Gleichenia*.
Much planted *Crotonia*, *Jussiaea*
Eugenia jambolana, *Annona*, tree
around Kalalae sugar cane
on lower slope, pineapple above.

Hanapepe Gulch - walls
covered by *Leucaena* scrub - some
Kiau (Elaeis + above), *Opuntia*.

Kiau - opium forest patches.
Beyond Hanapepe soil very red.
Low flat canyon mouths
open *Kiau* forest or savanna
pasture.

Wainoa R.

Thin *Feucaria* on walls of canyon
at Wainoa. *Kiau* at bottom.

Flats at w. of mouth of
river old lagoon bottom.
mostly cane.

Kekaha! Bluffs with
Kiau - *Leucaena* - cactus like
Pluchea odorata along Kokee
rd in lower part.

Upper slopes of canyon
wall pili grass, some
shrub & cactus.. *Dodonaea*
flow slope in cane.

Badly eroded gullies.
Grevillea glaerings
above cane area in very
bad shape - disease? fire?
Pteridium higher, *Myrsinaceae*
scrub scattered here.
Wilkesia.

Fog more abundant
upward. Also planted
Grevillea, *Melaleuca* & *Lasiandra*
locally.

Some *Ilex* up a bit
but basically tree forest.

Fog forest becomes closed
upward. Some *Fantava*

locally dense under-layer.

Waimea Canyon lookout - 3400'

Little green on ^{upper} canyon walls
except on steeper slopes. tiny
strings of *kuhihi* in ravines.

Slopes at top of walls densely
wooded. lowest slopes fairly
well wooded.

Plots of lehua forest at lookout
Acacia dealbata + several plants
 in it, but not in photo.

Erosion around river.
 Tibouchina along road
 above lookout.

Very little lehua. Hyphelia
 abundant along road.

Up a mile or so much
 planting - Eucalyptus, Cypress,
 Cherokee rose established.
 few houses.

Podocarpus common.

Lehua becomes more abundant
 also other native trees
 ground PMR establishment
Draconis. But still ~~are~~
 mostly koa. Rubus abundant.
 Kokee Park - lehua forest.

Pit in flat area in Kokee
 stream drainage at about
 (Camp Ten Rd.) in a mottled
 clay and goethite matrix,
 somewhat hardened into black
 ironstone. Ground water podzol??"
 (sample). Looks much like
 profile in Ivory Coast (deep soil).
 Lehua forest with ~~much~~ many
 planted exotics.

River ridge has koa.

Kalalau Road - koa gives way
 to Lehua somewhat above
 Kokee. Much Rubus.

(99-MF air photos show
 bog areas in alahai swamp.
 Much lehua forest
 flattened by Hurricane Dot.
Lehua Macarrii has very
 thin peat, hard rock.
 Patches farther in alahai
 swamp, peat up to 6'
 Patterson got about 8
 peat cores with hand auger.
 (On frames K1-58 + K1-33).

Photos show a striking
 mosaic of bog + forest.
 Bogs underlain by a white
 clay - largely halosite.

Probably much of
 this underlain by material
 like that in Kokee pit.
Lehua Macarrii much
 drier than other bogs. Peat
 1-2").

Forest rather open and
 degraded in wet areas,
 thick undergrowth with
 Rubus.

photo

Kalalau Lookout - clear dry
 ridges and steep slopes
 rather badly eroded.
 Lower slopes with scrub
 kuhui in gulches. Valley
 bottom forested. Cliffs

forested at top and upper
 $\frac{1}{2}$ to $\frac{1}{3}$, lower steeper parts
 almost bare but grassy.
 or with thin scrub.

Lookout surrounded
 by lehua forest - some Gleichenia.
 feet 10-15 m. tall, gnarled
 not very mossy. Canopy rather open.
 moderate undergrowth,
 some Rubus. Athyrium
 abundant. Doddy's also
 on ground.

Canopy open, but trees
 closely spaced, small
 average 8-15 cm. some larger
 to 20-30 cm.

Jeep road east of lookout
 photos of road and of
 plateau back. Good
 lehua forest.

Head of valley here has
 cliffs thinly wooded
 from top to bottom.

End of road is in cloud
 forest, mainly lehua, on deep
 peaty layer overlying clay
 bed (photos begin roll 2)

Photos in forest, stature
 to 10 m. Some Cheirodendron.
Ratelia (a very small slender one)
 on tree trunks.

Tibouchina down as
 far as Puu Ka Pele.

Small gulch that Kokee
 Rd. crosses has grassy
 upper slopes, esp. on west
 more bushy on east, esp.
 with Leucaena, kaua, cactus.
 Erythrina common locally.
 Far below bottom Kiaoae -
 Leucaena forest, much P. cucker
 in very bottom.

Road to Wahiaua

sugar cane. Then across
 a gulch wooded esp. with
Eugenia cuneata.

More sugar.

Turn left to Thain place.
 Through gate, then pasture.
 Second gate. Hill & rt.
 with koa forest. Planted
 Casuarina, Grevillea on some
 slopes. *Acacia confusa* and
Eucalyptus, a *Melaleuca*
 with very small leaves.
Albizia. Waiwi.

Along road an almost
 completely exotic forest.
 part reservoir.

Much Gleichenia. some
 lehua? then degraded
 lehua forest, some koa.

Area east of Wahiawa.
 Bog - trees almost completely dead. Gleichenia and low bushes left with standing dead trunks. Much *Lycopodium cernuum* shrubs where entire most of the trees of former forest. *Icaevola* abundant.

Bog covers about 20 acres.
 general level of vegetation about 3-4 dm.

- o Metrosideros
- o Gleichenia lin.
- o Lycopodium cernuum
- o Rhynchosphex
- o Lobelia
- o Ilex
- o Cheirodendron
- o Machaerina ang-
- c Cyathodes multiflora
- o Lantana
- o Peleg
- x Staphelia
- ~ Myrsine spp.
- ~ Viola
- l Carex
- o l Oreobolus
- ~ Eugenia cf. hookiana
- x l Parapalum ob.
- ~ Polypodium tenui
- ~ Wikstroemia sp.
- l grass

similar

Scattered through bog are larger shrubs of Metrosideros, Cheirodendron, Eugenia, Peleg, Lobelia, Myrsine Ilex.

Scattered small pools and irregular winding tracks filled with water

Some spots, especially low muddy ones dominated by Rhynchosphex + grass.

Lower?

Gulch down from Kihale to Spouting Horn.
 Cuscuta scrub, Eugenia curvini, Hibiscus tiliifolia
 planted Eucalyptus, etc.

W. extension of Haiku Range south slopes with grass and thin woods + scattered trees, upper slopes Gleichenia + scattered trees

W. of this Hibiscus tiliacera + Pandanus. Lower slopes planted Eucalyptus forest.

Lihue to Kapaa -
Hills beyond Hanamana
badly eroded, mostly
covered by thin soil with
scattered trees, more wooded
on lower slopes. Bluffs and
ledges gray... Much
red clay exposed in
great erosion scars.

14

1961 Hawaiian Is.

- 41467 *Psyrimocheia*
on edge of cliff in wet forest
68 *Bromusaisis angusta* Griseb. f. *angusta*
on edge of cliff in wet forest

March 11 - Wahiawa Bog,
south base of Kehili Peak,
east of Hanapepe River,
in open bog with depressed vegetation

680 m

- 69 *Drosera*
very common on mud
70 grass *Saccharis contracta* (W. & A.) Hitch.
common locally
71 *Lobelia*
common
72 *Viola hawaiiensis* Gray
rare
73 *Santalum ellipticum* Band.
occasional
74 *Korthalsella*
occasional, parasitic on
Metrosideros
75 *Rhynchospora laevigata* Band.
abundant
76 *Myrsine*
rare
77 *Polypodium tamaricinum* Kaulf.
rare, on base of shrubs
78 *Styphelia douglasii* var. *struthidioides*
common

Kauai

15

shrub 1 m. tall, buds and
pedicels glutinous, corolla
white, flushed distally with pink.
shrub 1 m. tall, flowers
and calyx deep maroon purple.

hairs on leaves reddish,
flud white (only one seen)
spikes blackish.

shrub with latex, 1 m. tall,
2 racemes from rosette
at top of stem, corolla
white with dark purple
lines in middle of lobes.
flower white within,
purple lined without.
shrub 0.6 m. tall, dull
reddish green; fruit green.
cylindrical, branching
decurrensately.

shrub 1 m. tall leaves slightly
chlorotic, fruit black.

shrub 0.4 m. tall; flowers
white, 5-merous.

16 1961 Hawaiian Is.

- 4147^{3a} *Pelea wieleae* Wava
occasional
2 74^a *Ilex anomala* H. & A.
occasional

Mar. 12 - wet slope Nono Range,
above Opaekeao Stream.

- 3 75^b *Messerschmidia racemosa*
in secondary forest on
steep slope

Mar. 12 - ridge east of
Hanalei Valley

- 76^a *Wikstroemia*
in boggy sparse low
forest on white clay
4 77^a *Gouldia terminalis* v. *macrocarpa*
in boggy sparse low
forest on white clay
78 *Ageratum houstonianum*
abundant on roadside

Kauai

17

shrub, m. tall,
buds greenish white,
shrub, m. tall, flowers
white.

25°

old tree 12 m. tall, 4 dm dbh
with thick branches,
dark maroon, glossy,
on immature fruit; buds
unopened.

730°

shrub, m. tall, sterile.

shrub, m. tall, decurrently
divaricately branched;
flowers dull purple outside,
green within; fruit blue.
erect, aromatic; flowers
bright lavender purple.

Mar. 12 NE. face Waialeale (~ photos) - thin forest on steep slopes or cliffs. Bright green, prob. *gleichenia* on sides of ridges at base. Cliff has narrow vertical valleys.

Flat land backs of Nono - mostly pasture thickets of *Eugenia cuminii*, Bib. til & Mango; planted Eucalyptusacea esp. in hedges.

U. of H. Org. Conf. Ita Bauxite Redencion Project. front of Maheleka Mt.

Kolor flor, slopes cut by deep ravines. Has evidently been pastured and abandoned (or not abandoned?), now covered by grass (*Melinis*?) with patches of *gleichenia*, scattered bocas - *Eugenia*, *Psidium cattleyanum*, scattered *Lysidium*. (3 photos will r.) *Malastoma*.

Check plot - no treatment
Past ab.

Glenwood grass
Lettuce glauca

Musa
Stachyphyllo
Richardie

Pasp. Comp.
Lysidium
Cuphea
Emilia sp.
Clephantopus mollis
Digitaria chinensis
Thru on topsoil - removed and replaced.

On untreated subsoil it was a year before any plants appeared.

first publ. Bauxite Red. Proj.
monographed rep't.
M. Tabularia Moraw., Blumer.

Nonou Mt. - (Sleeping Giant)
back side densely wooded down to pasture at base. Mixed grass + Mimoso.

Forest at base of strawberry guava, some *Eugenia cuminii*. Ground cover of *Oplismenus* with occ. *Polygonid. scol.* + *Thelypteris dentata*.

Upper and occ. *Aleurites* & *Pandanus*. Abundant str. guava seedlings, no native plant seedlings.

Upward into ravine *Eugenia malaccensis* becomes dominant - on slope only

Puhui - on side slope
me Pandanus, Psidium
graviola. This became
abundant locally.
Up the gulch the Psidium
littoralis became abundant
again, but not much
a closed vegetation.
Trees were to 2½-3 dm. dbh
+ 15 m. tall. Much
Nephrolepis, Thelypteris,
Marsilea, & Polypodium
with the Lomagramma.

Road up Pohoa Rd.

Ravine filled with
han and jova plum. Flw
slopes pineapple & cane.
Steeper slopes guava brush,
scattered Eugenia, mango,
planted Casuarina, some
ficus & fonscaea. Planted
eucalyptus.

Road around Kepa to Hanalei

Flw overlying old soil - charred
roots in soil at contact.

Pineapple fields - gulches
between filled with Eugenia
cuminii.

Hills or left - ridges
and steepest slopes grassy.
Slope loosely to densely
wooded. More as found

toward Lumaha.

Wood in lower valley
mostly Java alm. some
han, Psidium litt. Samanea
headruit. Mangos, guava.

Moloaa Beach.

Pasture on slopes. Wood
in ravines. Jevillea
sp. planted abundantly
(red fl.)

Then cane on flats or
low slopes.

Tuff cone some distance
to rt. said to have broken
through a coral reef.

Kilauea.

Kalihiwai R. bluffs
wooded with han, bals.,
Argemone cuminii. These,
with milo, casuarina
etc. in flw some grass.
Casuarina on bluffs to n.w.

Low pastures with guava
or brush, some pineapple.

Steep into inland densely
wooded except for areas of
Gleichenia on slopes.

Flw slopes in pasture.
lower ones pineapple or pasture.
Rows of Eucalyptus or
Eugenia cuminii along roads.
Guava and bals. in thickets.
some Pandanus.

Hanalei V. flat bottom has rice field, garden pasture (*Ricinus*, *Ipomoea*, rice). Lower ^{slopes} ~~green~~ with scattered trees. Upper wooded. Estuarine has forest in valley bottom & on lower ^{slopes}.

Pastures on east have been reseeded to *Paspalum*. P. def. East slopes steep, partly Gleichenia, partly thickets of guava, strawberry guava, *Cordyline*, *Pandanus*, and, above forest reserve boundary, some lehua.

Ageratum houstonianum abundant along east ridge. Well up on sloping flats there is lehua forest in which the trees are mostly dead or dying. Thick low brush and Gleichenia.

An area of white clay 15-20' deep on which is an open low lehua 3-5 m. tall with much Gleichenia. Thin peat or much larger 3-6", pH 3.8 m. pattern. Looks like a bog but with st. large trees.

These areas, a few acres, or 10s of acres in extent exist on the flat slopes but ravines.

Well above this, on red soil is further broken down lehua forest. ~~of~~ very tall slender *Pritchardia* scattered through area. Large trees dead. small epiphytic lehua on most of trunks, sending down roots like a strangling fig. Clusters of small astelia on them, also *Cladophloglossum*. (quite a few photos).

Road runs along ridge through cloud forest, predominantly lehua but very rich. Few dead trees.

At end of road runs ahead of some isolated flat plateau-like areas. Here are many dead trees.

Bananas in deep gulches even here. Few palms on steep slope. Rather deeply weathered red soil to red soil, a few feet.

Very irregular canopy. Some staghorn.

Photos across Hanalei V. and on ridge east, thicket of secondary wood + Gleichenia.

Bluffs west of Hanalei covered by Pandanus forest and in more exposed place by sea-walls. (photo) ^{not} less exposed by hau, guava, casuarina.

Lower slopes beyond Waimea grassy with scattered round trees.

Beach forest of casuarina, noroniu, croc., arancaria Haena - Hau to ridge with casuarina, guava on flats.

Cliffs with Bidens conspicuously in bloom. ^{Gutierrezia} grass, small shrubs, pockets of wood in gully-like valleys.

Pandanus on lower slope. Kuhia also.

Pandanus also up on high ridges.

This corresponds to fine grass on dry cliffs and ledges.

Mar. 13 - flight return to Honolulu at end of point directly in line with runway, the scrub back of the beach shows excellent wind striation.

Mar. 14 Honolulu-Maui flight. about 2/3 of the floor of Diamond Head crater, and part of lower slopes are densely wooded. Outside slopes only very slightly vegetated, mostly toward base.

Photos of Koho Head area.

Molokai on right -

Apparently a marsh back of second long beach from west end, surrounded by kiawe forest on flat.

Uplands east of this green, with considerable red erosion scar. Momomi sand strip largely re-vegetated by kiawe? forest. Also slopes of ravine side of it.

Otherwise considerable grass with red scars and scattered small trees or bushes, or no woody vegetation at all. Pineapple fields on most of upland flat ground.

Generally the thickest woody vegetation is on steeper slopes, but not consistent.

Slopes up to East Molokai grassy, cut by wooded ravines. Interfluves, wooded

1961 Hawaiian Is. Molokai

upward. Cliffs more and more wooded eastward.

Kalaupapa pen. all grassy except talus at foot of cliffs, which is wood.

East Molokai mostly cloud-covered. Lower part of cliffs and mouths of valleys visible, sparsely and irregularly wooded, otherwise grassy.

Some open flat spots above cliffs, but Wailau & Halawa, probably open too.

Ridges n. of ~~Wailau~~ Halawa rather dry and denuded, some erosion. Flow slopes n. of ~~Wailau~~ Halawa very green, gulches dry and scarcely wooded. Small inlet grassy.

West Main - Flow slopes cultivated, gulches wooded, but lower parts only sparsely so on west side. Upper parts of flow slopes grassy up very high on n.w. side.

Gulches on north side very deep, wooded except near mouths. Flow slopes bright green, ~~green~~ pasture. Cliffs ~~are~~ thinly vegetated.

An ~~old~~ Kahului rd.

Cerezo
scrub

can go up & break in slope. Food comes down to live.

Around bay w. of Kahului are rather bare somewhat eroded hills, valleys and ravines, in them wooded.

Much Kiaue forest back of Kahului on Isthmus, rest of Isthmus cane. Some rows of trees along roads, trees around villages.

(33 min. Hoi-Kahului.)

Maui - Wailea to Iao Valley by taxi.

Planted Casuarina on lower slopes - mixed wood of Persea, Aleurites, Eugenia cuminii, Samanea, Melia, Mangifera, etc. in valley bottom. Giava.

In canyon steeper slopes are grassy, less steep have open to closed scrub. ~~large~~ Alliaria in little hanging valleys and in side gulch bottoms. Upper cut slopes, ridges, cliffs eroded, but rather sparsely.

Up in valley guava scrub on lower slopes above the Kukui which here fills

the valley bottom

Cliffs here thin vegetation.

Cordyline at bases,
above guava forest.

End of road at view of
needle. Hair point ~~come~~
road end. Patch of native
forest on steep slope on
south side above bush.

~~many
planted
ornamentals~~ several other smaller bits
on slopes at foot of cliffs
but mostly lehua.

Little but thin grass on
cliffs.

Around lookout and
trail immediately above
it mostly guava scrub.
Some small *Thecridium*
on side toward needle.

Weeds on trail, ~~fallows~~, later.
Sphagnum & *Nephrolepis*
exaltata abundant,
a little *Isotoma* medium.

Baddeia and *Micolepis*
over edge toward needle

Stupendous erosion,
cliffs, peaks, waterfalls
no bedrock, a basalt
spine. Bed of stream
with great boulders.

Low laurel series but
probably planted.

Cordyline
scrub
self-cult
spotted
petioles
petiole
petiole

Mar. 14 - Mailuku - Kabului
patches of kiau, building
pond with purple marsh.
Weed patches.

Mar. 14 - Kabului - Olinda -
Waukamoi 8:30 - 12:40

~~Plantations~~ Plantations on level
ground of Isthmus and
up lower slopes of Haleakela.
Road lined with Grevillea,
Sawanea, Eugenia, etc. at
first. Not on slopes.

~~lawns~~ lawns filled with hantane,
Guava, Sawanea, cactus,
Medic.

Pukalani. At. Pt. 37 - Pt. 40.
Pineapple fields. some pasture.
Eucalyptus, *Acacia*, Grevillea
Makawao. Tim on Pt. 39.

Above Makawao ~~pasture~~
pasture with patches
of Eucalyptus forest.
with guava undergrowth
some ~~or~~ instances of *Acacia*
dealbata.

Road lined by *E. globulus*
Olinda Prison Camp.
gorse begins.

Eucalyptus first. Then
stretch of pasture, now
with ~~baddeia~~ *baddeia* and a

few other native plants.

Then the road enters a forest, at first mostly planted, *Cupressus macrocarpa*, *Thuya*, and *Eucalyptus*, then changing at once to native montane rain forest - lehua forest with strong admixture of iron and Cheirodendron.

Drive for about 2 miles through excellent forest of this character to intersection with road to Waikamoi pump.

Stop here and proceed on foot down road toward pump.

At 4700' Dense trees at entrance are lehua, Cheirodendron - several small trees immediately on left, small Abutilon beneath trees on both sides. Very fine-leaved large shrub immediately to right of entrance *Styphelia* com. serrate-leaved shrub ^{at} is *Bromocassia*. Opposite it, on left, *Copromela*.

20 paces in, on right, the tree with narrow leaves ^{long} like *Acacia* is *Ironwood*.

To the left of the road the forest has been cleared along the pole line. *Rubus* sp.

has invaded this area, also *Gleichenia glauca*, *grevillei*, *Lycopodium caninum*, *Glech. linearis*, some regrowth of lehua, etc.

Of the two large ferns along the road, the bipinnate one is *Sadleria souleyetiana*, the tripinnate one *Cibotium*.

Along roadside a form of *Punicea vulgaris*, *Poa*? or *Holcus*, *Cyperus*.

On mossy banks and tree bases *Heteros granulosus* var. *insularis* is abundant - creeping, with vermillion fleshy fruits.

Athyrium cf. *pinnatum* common.

Cross pole-line clearing and descent into low part of iron, lehua, Cheirodendron. *Gleichenia* here approaches *g. lin.* var. *tomentosa*.

Careful examination of Cheirodendron may yield *Korthalsella platyphylla*, a leafless Loranthaceous parasite.

Just at first sharp turn in road *Clermontia* sp. may be seen straight ahead - blooming

leaved shrub in brush up
on bank. *Vaccinium calycinum*
is small shrub on roadside
here. Good examples of
Cibotium sp. glaucum or
chamaescoparium just below
this turn.

Around the next turn,
a few feet off trail to right,
a half fallen trunk with
Astelia sp.

Undergrowth along road
has much *Eupatorium*,
adenophorum, *Glechoma*,
Lycopodium cernuum,
some *Lysimachia*, *Vaccinium*,
Zantedeschia introd. along road.
On old tree fern trunk on
right *Grammitis pseudogrimmitis* and *Hymenophyllum*
obtusum?

Mysmaea sp. a slender
shrub on right just below
this.

Lehua dominate here.

Off the trail the under-
growth contains a profusion
of ferns, incl several Thelypteris
(*T. cystothecoides* st. aff. etc.),
Adiantum, *Asplenium* ~~sp.~~, *Cibotium*,
a very large ~~large~~ *Cyathea*.

On fallen log *Hymenophyllum*
obtusum, *Speromelia* sp.,
Nertera, *Astelia*, *Polyodium*
sp., *Thelypteris* *lanceolata*.

P. lanceolata
A. l. l. l. l.
S. p. t. t. t.
P. l. l. l. l.

scrubs include *Ilexa* & spp.
Procris *saxicola*, *Coprosma* spp.
Mysmaea (*Rapanea*) spp.,
Hymenophyllum on tree trunks
Climbers - *Alyxia*, *Smilax*,
Stenogyne sp., *Vaccinium* sp.,
Glossodia *teretifolia* var. *cordata*
(scrubber), *Rubus sandwicensis*
(spineless), *Cryptandra*
cf. *cordifolia*, *Clermontia* sp.,
Cyanaea sp. (large lvs. spineless)

Good place to go in forest
to left 50' before first bridge.
2 plots in opening with two trees.
Beyond bridge 30m. as
left, *Glossodia hillibrandii*.
At turn, *Fragrantia* as
left. Good understory
of tree ferns in open living
forest. Gleich, lis.

Abundance of young
Cheroendron *dubothele*
due to opening of road.

Beyond bridge *Clermontia*
fairly common, *Rubus* and
(as well as *P. penetrans* + *R. ros.*)
Pipturus at first turn on left.

Beyond second turn large lehua
tree over road with excellent
display of epiphytic *Astelia*,

Polyprop. cf. saffordii,
Clad. hirtum, *Polyprop. pell.*
Asplenium sp. (tiny, at base)
 " *Phlox* in the forest.

1/2 mi.

On road out - 3 curve
 with large trees on either
 side. Koa dominant here.
Acacia tree
Chionodendron
Metrosideros collina
Saddleria souleyetiana
Cibotium chamissoi
Myrsins cf. *lessertiana*
Gouldia tree, v. *cordata*,
Broussonetia rigida v. *hawaiiensis*
Coprosma ~~sp.~~
Grimmia
Pae. *calycinum*
Hibiscus *penetrans*
R. sandwicensis
Cyrtandra *rubra*
Cyanox sp.

Epiphytes

{ *Daphnoglossum hirtum*
Streptogyne

Polyodium thunbergianum
 I. *peltigerum*

more
up
to
it

Chenodecydion seedlings
Bromowattie seedlings
Daphnoglossum
Grimmia shrub
 - *Peperomia* sp. *schiediae*

Hymenophyllum revolutum
Astelia

Terns

Athyrium cf. *poratum*
A. sandwicensis
Trichomanes *bauerianum*

*Pamahani**Lemnaceae* sp.*Gouldia billibrandi*

Makawao - Wapalakaia R.

RT. 40 12:50

E. of Makawao - pastures
 with scattered planted
Eucalyptus, *Cupressus*, *Grevillea*,
 etc.

Palakaii jet. Pineapple
 left on rt. 37. through
 pineapple fields.

Turn on lower Kula Rd.

Pine fields, gulches
 with *Oprunias*, *Santana*

Weedy roadside with
Chloris gayana, *Tricholaena*,
Ricinus pastures.

Planted *Grevillea*, *Acacia*
 in gulches.

Much *Opuntia* in
 pastures *Abutilon*, *Lantana*,
Malva can be seen on rt.

Waukeka Ormosia

Gulch - north Acacid de.
Pteridium in pastures.

Waiahoua.

Schinus. acacia

Holy 37 again.

Much acacia dealbata
scattered farms.

Vegetable gardens.

Love flows with pasture
Lantana - heavily parasitized.

Heokea - Kula Lava town

Rough pasture or law.
much lantana + cactus.

Vast expanses treeless.

Motokini aical in
strait this side of Lanai
Melia trees.

Cinder cone below on point.
Grevillea. Nicotiana glauca

Melia. Argemone.

Eucalyptus plantings
around Ulupalaha Ranch.

Prospect Hill - early
Eucalypt. plantings.

Kalakaua

Punahoa

* Ormanthus

Lophira

Charpentiera obvata

Dracaena

Pelea + ms.

Tetraplasandra

Mysme

Chenodendron

Myoporum

Ochnosia

Alyxia olivaeformis (male la b)

Dodonaea

Osteomeles

Cuphea celastri

Coprosma

Alphitonia

Metrosideros

Styphelia

Funtalam haleakalensis

Pipturus

Nothocestrum

Sontoria

Claoxylon

Weeds

Didens pilosus

Balanusodorum

Gnorophorus elongatus

Nicholsonia

Hypochaeris radicata

Ullaria media

Passiflora sp.

Convolvulus tricolor

Euphorbia peplis

Plantago lancea

Chenopodium muricatum
C. botrys
Commelinis diffusa
Rumex gigantens
Oxalis corniculata
Agrostis
Phragmites pennianus
Crocosmia
Verbena officinalis
Heterotheca grandifolia
Cyperus
Geranium carolinianum
Pennisetum clandestinum
Carex
sp. inflorescences
over
Eupatorium adenophorum
Solanum nigrum
Lythrum
Cirsium
Korthalsella - split in 2 sections
 Ferns
Polypodium pellucidum
P. fluminense
Pteris
Lycopodium nudum
Pteris
Asplenium

March 14 - Kula Pipeline west
of Waikamoi Stream, Haiku Mts.

In montane rain forest dominated by *Metrosideros*

Grammitis tenella Kaulf.

epiphytic on tree trunk

41479 1 80 *Clermontia*
occasional

Florots of *Osmanthus*,
Lantana, *Cuphea*,
Dodonaea

Forest fades out into
scrub of *Dodonaea*,
Styphelia, then into
Styphelia + *Asteraceae*.

Ruddy tannstones, 4-5.

Lava flow above Mapalakau
lava mostly lobera.
Pallae temporalis & *Psilotum*

Just beyond: Mapalakau
second Eucalyptus on rt. 37
a braken grove, then
lava with Kalarehol.
Bouea frutescens naturalized.
Hunnermania mexicana
on slope of cinder cone.

Henry Inciong - state forester.

1250 ft

4000-4200'

shrub 1.5 m. tall, lactiferous,

- 41481 Carex
in small openings
- 1 82 *Pipturus albidus* (H. & A.) Gray
rare
- 1 83 *Asplenium*
rare, epiphytic on base of tree,
- 2 84 *Rubus penetrans* Bailey
very common in openings
- 2 85 *Chirodendron taguminum* Griseb.
var. *helleri*
very common, especially
in clearing along pipelines
- 2 86 *Holcus lanatus* L.
common along roadsides
- 1 87 *Hymenophyllum recurvum*
~~fallax~~ epiphytic on tree trunk
- 1 88 *Hymenophyllum recurvum*
epiphytic on living tree trunk
- 1 89 *Hymenophyllum obtusum*
epiphytic on tree trunk
- 1 90 *Grammitis tenera* Kaulf.
epiphytic on tree trunk
- 1 91 *Pelea* sp. *olowaluensis* W. John
occasional
- 1 92 *Pelea* sp. *haleakalae* Stone? ad. off
occasional (~~infrequent~~)
- 1 93 *Polyodium* sp. *grammitis*
rare, epiphytic
- 1 94 Carex
locally abundant in muddy places
- 2 95 *Coprosma stephanocarpa* H. B. K.
common in undergrowth
- 1 96 *Rubus sandwicensis hawaiiensis* Gray
common in undergrowth

branching at base
nearly erect. young
shrub 1.5 m. tall. Leaf veins
reddish beneath.

canes branched,
flowers 3 cm across, white,
fruit black when ripe.
small tree 4 m. tall aromatic,
fruit purplish brown.
erect

front bent downward

shrub 1 m. tall flowers
green
shrub 1 m. tall, buds green.

erect; leaves glaucous
beneath.
shrub 3 m. tall.

shrub 2 m. tall; flowers
rose purple.

42

Sept 1961 Hawaiian Is.

- March 14 - Anwahi,
s.e. Puu Ouli, s. slope of
Haleakala
in dry open sclerophyllous
forest on aa lava flow
- 41497 *Usnea*
abundant on dead branches
of trees
- 1 98 *Pipturus*
rare
- 1 99 *Carex wahuensis* Mey.
rare
- 41500 *Astyphelia*
abundant
- 1 01a *Dodonaea*
abundant
- 1 02a *Dodonaea*
abundant
- 1 03a *Polypodium thunbergianum* (L.) Kaulf. & Christ.
rare in crevices in lava
- 2 04a *Claoxylon*
rare
- 1 05a *Asplenium nidus* — *nigrum* L.
rare in rock crevices
- 2 06a *Dryopteris undulata* (L.) Gray
rare on ledges Det D. Blamey 8/54
- 2 07 common on open ridge
- 2 07a *Cyperus billardi* Benth.
common on open ridge
- 1 08a *Astyphelia*
occasional
- 1 09a *Cheirodendron trigynum* (Gagnep.) Hillman
occasional

3800-4000'
1200M

Maui

43

- shrub 1.5 m. tall,
fruits carmine
- shrub 1.5 m. tall,
fruit light green, somewhat
turning tawny on drying.
- shrub 1.5 m. tall; fruit
very dark purple, glossy,
rather inflated.
- small tree.
- scattered solitary culms
- shrub 0.7 m. tall, fruit carmine.
- tree 6 m. tall, fruits dark brown.

44. *Grewia sandwicensis* (Gray) Korth.
 10. *Bryopodium lanatum* rare
 41511. *Nothocestrum latifolium* Gray
 ? occasional
 12. *Pisonia sandwicensis*
 rare *Pisonia* Endl. syn. *Pisonia*
 13. *Coprosma stephanocarpa* Hbd.
 rare
 14. *Alphitonia ponderosa* Hbd.
 rare
 15. *Hantulum haleakalensis*
 locally common
 16. *Euphorbia celastroides*
 locally abundant
 17. *Pteris cretica* L. det. D. L. Jones 1/10
 very local in grass
 18. ~~Carex~~
 19. *Asplenium adiantum-nigrum*
 rare

March 14 - ~~Kula~~ Headwaters
 of Kailua Stream, ~~south~~ west
 of Waikamoi Gulch,
 Maui Vol., n. w. slopes Haleakala
 in montane rain forest
 dominated by *Acacia koa*

19. *Coprosma stephanocarpa* Hbd.
 common
 20. *Scheidea* ^{aff. *Yewia*} ^{sp. nov.}
 rare, epiphytic in *Acacia koa*
 21. ~~Coprosma~~

Mani
 tree 4 m. tall, ripe fruit yellow. 45
 tree 5 m. tall
 same tree as # 42033
 tree 4 m. tall
 tree 4 m. tall, young
 leaves coppery beneath.
 small tree 4 m. tall (older,
 much larger), flowers
 bright red, scarcely
 any odor, ripe fruit black.
 flat topped tree, ~~tall~~ 4 m.
 tall, lactiferous.

42701
 12.817 M.

shrub 2 m. tall.
 loose climber, sterile.

March 14 - Kula Pipelins west
of Waikamoi Stream

Hauula Uka, n.-w. slope Haleakala

41521. *Coprosma schrava* Oliv. var. *schrava*
occasional

22. *Mectia grandis* var. *insulicola*
abundant on mossy
banks, logs and tree trunks.

13. *Trichomanes*
common on ground.

March 15 - Waikamoi Stream
at Hana Road

24. *Tibouchina semidecandra* (Schrad.) Cogn. & Sch.
bank of small rivulet
in bottom of gulch

March 15 - west slopes of
Haleakala along highway
to summit.

in open scrub on weathered lava.

25. *Lepachina hastata* (Gouy) Epling
very local, colony of 5 clumps,

26. *Luzula campestris* var.
^{hawaiiensis} Baker.
occasional under ~~Styphelia~~

bushes.

27. *Styphelia*
abundant

28. *Styphelia*
abundant

29. *Asplenium trichomanes*
rare in crevices in rocks

30. *Asplenium nidus* (L.) Willd.
occasional in crevices in rocks

4000'

1220 M

Shrub.

170 M

Cogn. & Sch.

1830

bushes.

ctd. p. 50

shrub 2 m. tall; flowers
green.

creeping; light green;
fruits vermillion.

slender erect shrub
2 m. tall; sterile.

erect, ^{to} 0.7 m. tall,
many stems from
base, ^{nodes} deep rose purple;
plant strongly aromatic when
broken.

shrub 1 m. tall,
flowers white.

shrub 1 m. tall,
fruit pinkish white.

Mar. 15 - Wailuku to top of Haleakala. 7:00 -

Thru cane fields to Pukalani first. (see p 29). *Tricholaena* conspicuous along roadsides. *Chloris gayana* and *Panicum maximum* also.

Many small farms and gardens just below and about Pukalani and Makawao. Pineapple fields over most of country bet Pukalani and somewhat above Lower Kula Rd. Then only on rt. Pasture with patches of Eucalyptus on left. From 2000' all pasture with patches of Eucalyptus scattered Casuarina and Grevillea. Rows of Eucalyptus and large blocks. a few *Cupressus macrocarpa* on left at 2400'.

Row of Jacaranda on rt at about 2400' Grevillea planted below road. More Eucalyptus. Then open pasture. *Opuntia* in gulches and scattered in pastures. More Jacaranda along road at 3000' then Eucalyptus and *Acacia dealbata*. Small farms. Blocks of *Acacia dealbata*, dominating

landscape to Haleakala turnoff. Scattered clumps on up the road. Many ~~old~~ houses and notable flower gardens; many escapes. Patches of *Acacia*, ~~very~~ cypresses. ~~Hedysarum~~ and other conifers. *Myricea paya* occasional.

Scattered *Erythrina* in at about 3800'. *Acacia* and *Eucalyptus* patches, and small farms.

Planting of *Diospyros kaki* at about 4000'.

Belt of eucalyptus at 4200'.

Magnificent view of Ilemaus and West Maui from just below this (stop?)

Above this belt open rather rough pasture. *Pteridium* rather common, but generally the pasture is in good shape. Eucalyptus plantation on left at 4700-4900'.

Eucalyptus in ravines on rt. Sparse scrub, mostly *Erythrina* from about 5500' much grazed. Much *Pteridium*. Becomes dense and mixed at about 6000'.

50

1961 Hawaiian Is.

(ctd. from No 46)

41591a (gram) Heliaea leucostachys -

2 common

March 15 - rim of Haleakala
crater at Kalahaku Overlook1 32 (gram) Deschampsia nubigena Hb. 3 ft.
common on loose volcanic
debris

March 17 - Kipohi House lots

1 33 Pipturus argenteus var.
common in undergrowth in Paeao about
100 ft.
on lava.March 17 - coast south of
where Kii flow of 1955 reached sea
in scrub forest of Metrosideros
on aa lava.1 34 Diospyros ferrea var. sandwicensis
occasional2 35 Canthium odoratum (Forst.) Schum.
commonMarch 17 - Kalapana Beach
on dunes of black sand1 36 Digitaria henryi Pendle
very local, holding sand1 37 Digitaria ciliaris (Retz.) Kuntze
common locally, holding sand,1 38 Panicum repens L.
common on sand flat
around brackish pond.Maui - Hawaii
panicle purple.

2680 m.

dense tufts.

2 m.

shrub 3 m. tall leaves
glossy green beneath,
with red veins.

4 m.

shrub 3 m. tall

shrub 1.5 m. tall, leaves
glossy.

1 m.

prostrate, forming thin mat.

forming dense sod.

Stop at small bridge at
6200' large bush of *Rubus*
~~andicuum~~ ^{var.} ~~macroracum~~ (?) just below bridge.
Trisetum common here.
Large rosette of *Polyptichum*
~~luteo~~ ^{luteo} *paleaceum* below bridge
on walls of ravine.
Several int. grasses here
incl. *Anthoxanthum odoratum*.
also *Oenothera stricta*, *Eriksen*
Rumex acetosa, *Eupatorium*
adenophorum.

In scrub *Copromos montana*,
C. erioderoides, *Sophora*
chrysophylla (bush on
st. wall of gully below bridge)
Dubautia strathbrokei,
Vaccinium cf. *reticulatum*,
are all common.
Several bushes of *Lantana*
haleakalensis in ravines
75 m. above bridge.

Geranium cuneatum var.
tridens on left somewhat
above that.

Asplenium sp. and
Polypodium pellucidum
in crevices on wall of
ravine. *Coreopsis* and
Pianella, also *Asplenium trichomanes*
Pteridium abundant.

7000'

1000'

A few scattered compact
Metrosideros coll. ~~even vars.~~

Dodonaea, also, esp. above and
below next small bridge.

St. *Sphagnum* and *Vaccinium*
dominant on relatively
gentle slopes.

Sophora, *Metrosideros*,
Dubautia, *Dodonaea*, *Copromos*
Photos of West Maui and
of scrub.

Planted Eucalyptus at
cattle guard.

Pine plantings below
road over considerable area.

Entrance to Park.

Eucalyptus and pine planting
about Park #8 residence.

Above here *Sophora* becomes
a very important component
of scrub. *Geranium*
beds more common.

Park #9

Proportions of species gradually
change upward. *Vaccinium*
and *Geranium* and *Copromos*
montana become more important.
Lantana very rare.
Dubautia becomes common
upward, 2 spp.

Bush becomes more sparse
upward.

considerable lava lava.
small clump of planted
eucalyptus and conifer
below road.

Sophora fair sized in very
open scrub or shrub savanna.
Shrubs more and more
sparse, also more deforested
at perhaps 3⁰⁰⁰' Almost grassland

Sophora, Ityphelia most
abundant with some
Vaccinium + *Dubautia* on
lava beds.

Side road to left, to
Kalahala Overlook.

Small patch of *Aegiphilum*
in enclosure.

Low bushes here almost
all *Ityphelia longistylis*.
Grasses, *Trisetum* and

Hypochaeris radicata
is yellow dandelion like flower.

Tetramolopium burmite
just outside Overlook enclosure
to left. *Lugula* comp. v. *hawaiiensis* do

Below is enormous caldera
a lava desert - with
a dozen or so big cinder
cones and a black lava
flow in f.g. running
down to left to Kaena Gap.

Varst retic. very dwarfed
here.

On up. Desert of broken
lava, with scattered
depressed Ityphelia,
some *Dubautia* - taller
shrubs. Road along crater
rim.

Observatory 9800'
Cliffs below have scattered
Dubautia shrubs.

Trail to white hill 380 yds.
has a boulder desert with
scattered *Dubautia* buds,
tufts of *T. setosum* and
rosettes of *Hypochaeris*
between rock. Light gray
slabby rock very dense.

A little *Tetramolopium* in
crevices.

Cabbage butterfly here.

Road to Red Hill - almost
complete desert. several *Dubautia*
bushes only.

Red Hill and Magnetic Hill
piles of red cinder.

Hawaii can be seen
in distance. To E. Lava on Moleke
to west.

Highest *Fernaria* seen
about 3500'. Scrup. well
developed mostly closed
or almost so below here.

Dodonaea doesn't go far above

partly hq. *Geranium*,
abundant ¹⁵⁰ just above hq.
Silene silithroloides
along rd. at about 8900.

Lepidium hastata above
road in open Elyphelis.
Vaccinium scrub.
Crepis pumila, *Polygon. pelt.*
Pteridium esculentum
Synysia, *Carex wahlenii*
(at culvert no. 378A 718
small branch rd. just below
6000') on top of low road cut.
about 5 clumps.

Beyond a bridge and pole line
about 100-150 m.

Trentepohlia on bark of
Eucalyptus at middle alts.
Bright orange. Just above last
houses. Also on Acacia.

Mycena ferruginea rather common
among small palms.

Pityrogramma on road cuts
in pasture above pineapple field.
Bark at Pukalani at 14:20.

Mar. 15. Mokawao toward Hana-
^{12:25}
Many amaranths in village
low swell pineapple field.
Then pastures and small
parks - thickets of Acacia.
Kohono area.

Eucalyptus, some Cupressus.
Pasture. Guava forest and
some Kukui in gulches.
Kauipakalua.

Pasture with clumps of
trees mostly Eucalyptus.
Guava + Kukui in gulches.

Dirt road. Large Eucalyptus
forest on right in distance.

Deep gulch with Gleichenia,
Guava forest, guava scrub.

Pineapple on right.
Gulches with guava.
Eucalyptus, Mango. pasture
and guava thickets, mostly
Eucalyptus clumps

Peach.
Pitahaya and guava
along rd. Kukui - guava -
Pandanus forest in gulches
and hills to se.

Join Rd. 76, turn rt.
Kakepi Gulch - mixed
lowland forest - guava,
many Kukui, Pandanus,
strawberry guava.
(Hills with low) guava

scrub and pasture.
Road cuts with a few
Styphelia, Leuca, boas
sprouts.

Paved Hwy. Pastures
some scattered brush -
guava, pandanus, mangos

Athyrium, *Hypopodium*
cinnamomeum on road cuts.

Gulches with guava,
Gleichenia, etc. Eucalyptus
forest above. Pastures on hills.

Gulches with han, guava,
bulinii

Breadfruit, rose apple.

Huels.

Ward sheared rose apple.
With mangos, some han, much
guava. *Eugenia cuminii*.

Gleichenia, *Pandanus*, bulinii
Gulches and hill with
small pastures and patches
of scrub. Ferns - *Nephrolepis*
Sphaerocarpus abundant on cuts.

On. Han and *Eugenia*
malaccensis up gulches
Kaelua - houses, small
farms.

Much han fruit.
Eucalyptus groves. *Acacia*.
Bamboo on gulches.
Mixed lowland fruit

in gulches and on slopes.
with many planted trees.
Melaleuca, *Eucalyptus*.
much han.

~~Tropaeolum~~
Hypoestes in cuts
with fern.

Huge bamboo clump at
Kaaisa gulch.
Some han, mountain
apple.

Eucalyptus and Melaleuca
Gleichenia on bluffs.

Waikauai Gulch. Water dry.
Bamboo forest on e. side on w. side
a mixture of guava, bulinii,
pandanus, han, with han
and Eucalyptus above on ridge.
Many introduced ornamentals
near bridge -

Xanthosoma, *Puddesteria*,
Impatiens, *Melastoma*, *Crisp.*,
Lemna, *Adiantum cuneatum*,
Thelypteris sp., *Nephrolepis*
biserrata, *Ramahia*, *Connarus*,
root *Drimaria* on dripping cliff
under bamboo. *Anthonox*.

Breadfruit on left just
before car out of Yikawoi.

Guava scrub on hills
invading pastures.

Ridges with *Gleichenia*
and planted forest of *Acacia*
Melaleuca, *Eucalyptus*, *Asplenium*
confuse.

gulches with balsa,
Pandanus, Acacia cuprea,
Erythrina var. grossa.
Lphothodes (?)

Kauaihuna Park - stop
trees labelled; view.

Pandanus on bluffs, balsa.

Honomane gulch

Mixed forest incl. *Lphothodes*
much balsa forest on lower
slope. Balsa in gulches.

mountain apple, guava, mango,
Pandanus, Cocos. *Datura stramonium*.

On e. side - balsa forest below,
Pandanus above. Much
gleichenia also.

Same general mixture
for several valleys. Pandanus,
man. balsa abundant.

Artemisia on bare cliffs
somewhat before Keanae.

Forest at Keanae largely
an esotic mixture.

Keanae Pen. view. Two patches.
Mouth of Ko'olau Gap. on it.

Breadfruit trees just
after Keanae, before Ko'olau Gap.
View up gap.

Taro patches below on sea
side. View. Waipahu footout.
Falls. Waioleani Falls.

Some native plants in
thickets and on cliffs. Kon.

Koa abundant for
a little distance,
Clermontia + *Cibotium*
on cliff.

Koa to well into West
Waialua iki. also beyond
it into East Waialua iki.
Lodopis. & *Clermontia*
scattered below. Plants
Melaleuca much less.
almost into Kipilihi.
Nice waterfall.

Road up a flat top
with mixed koa and
esotic forest. Then koa
with lemon + guava

Puakao Park.

Waikamei Gulch - above
water fountain a clump
of *Toucharanda latifolia*.

Polyptodium scolopendria
common on cliffs.

From Job. 36 + 40, along 76 &
Kahului -

Rolling pasture land with
some pineapples.
gulches with guava bush
& some balsa. Some pastures
invaded by guava, + schinus trees.
Plane
Hawaii - Haiku

Pauwela - mostly pineapple plantations, wood & a bushy gulch. Wind break of Casuarina on left, sheltering mango orchard.

Lowlands along sea - some Kiaue, Seneaera, Hugenia cumini, - in gulch with new bridge. More pineapples, then cane plantations to Kabulni. Kiaue in gulches.

Mar. 19 - Air trip Kabulni-Hilo. narrow strip of kiaue back of beach at head of bay, not on north side.

Northwest slope is mostly pasture, wooded gulches. Lower slope pineapples.

North slope is generally wooded - native forest except a belt on west side.

Pastures extend around much farther on lower slopes than above locally much invaded by guava (?).

Pasture spreads out just before first large bay and gulch. 2 gulches before Keanae Peninsula. Pans in bottom of lower

part of largest valley. Beyond here it seems to be worked to sea, except for patches of Gleichenia on a few flat ridge tops and a few clearings and small areas of pasture above sea cliffs, some areas up or slopes may have been cleared.

Hana area has extensive pastures above and west of airport, also some to east of this about and east of Hana. Forest separates airport area from the. Lower gentle slope around coast from Hana are in pasture

March 17 - KMC to Observatory
Low open lehua forest
or scrub with scattered
tree - scrub of *Hypolexis*
and *Vaccinium*. Some *Ludisia*
and *Dodonaea*.

Turn toward Observatory
both scrub and trees
more sparse. Mostly *Hypolexis*
but some *Dodonaea*. Gradually
more sparse to Observatory.

KMC to Volcano House
sparse forest.
steaming flats.

Volcano House to Olao -
lehua forest with *Gleichenia*,
some *Ludisia*. Very soon
changing to taller lehua
with well developed understory
of *Cibotium*.

Park Boundary.

Concentration of *Cibotium*
along road for short distance.

Row of *Cryptomeria*.

Tibouchina very abundant
near *Cryptomeria*.

Row lehua with some
Cibotium *Ludisia*, *Gleichenia*.
much *Tibouchina* locally
along road.

On it a large cleared
area with *Andropogon* and

497663

other grasses, some slight
invasion or sprouting of
lehua.

Lehua forest on left
with a little planting of
exotics.

Then a considerable
stretch of medium lehua
with *Cibotium*, *Gleichenia*
and *Ludisia*. *Tibouchina*
abundant along roadside.
(M.p. 23)

From here on much
planting of exotics.

Eucalyptus, *Melaleuca*,
Casuarina, an areoid
palm.

Forest more and more
irregular.

M.p. 21-20-19

Road bordered by *Cibotium*.
Forest irregularly mixed
Eucalyptus, *Melaleuca* -
still some lehua, especially
young trees. Locally lehua
still dominant.

Hedychium abundant
bet. M.p. 19 & 18. Cf M.p. 18
much strawberry guava.

From here much less
lehua, not many tree ferns.

Thickets of strawberry grass.

~~Abundant~~ *Eucalyptus*.

Melaleuca forest M.p. 17. Then

on left cleared land.
Mountain View.

From here down - sugar
cane plantation, banana
gardens. Just beyond M. Lien
Gambusiina mexicana n left.

Cane plantation (mp. 19-14-85)

Then bushy cleared land
with strawberry guava.

At M.P. 13 grove of palms

then more cane plantation.
Lehua forest in distance to
right.

More strawberry guava
lands. Then M.P. 12 more
cane plantation, scattered
dwellings. Well before M.P. 11
to it and after - more numerous
dwellings along road, cane
away from road. Came to M.P. 10.
Village. More cane.
above Kuituton hwy - breadfruit n rt.

Olaa - ~~Kapaa~~ Lahea.

Cane fields. Large bananas
and mangos just out of Olaa.
and 0.3 mi. out a large Chinese
Boanyan in yard on rt. low
bamboo.

Guava scrub with
Gleichenia and then Gleichenia
with scattered Lehua.
This for some distance -
a mile or so, then with
mangos along road
+ 91.5 corn land with Andropogon.

Upper
on rt.
of Olaa
lands
well left
a
41778.0

- 91.3 Cane plantation, grove
of Cassuarina. Open land
with Andropogon sparse
small Lehua. Then
more Gleichenia
with sparse Lehua
on rt. Andropogon and
Lehua a lot. - this for
some distance, with
Lehua becoming longer
and more dense
- 91.3 Var Gleichenia with little
Lehua, then Lehua
becoming more plentiful.
Andropogon, some Gleichenia
sparse to less, sparse Lehua.
Large grassy field at rt.
Sparse Lehua on road
across field. Andropogon
sparse Lehua on left,
then on rt. also. Orchids
very common in these
fields which stretch
with patches of Gleichenia.
- 91.7 3 for 2.5 miles. Then on
rt. Gleichenia with more
abundant Lehua, then also
in left, some patches of
Andropogon, some of Gleichenia
in either side, with
fairly large and abundant
but open to sparse Lehua.
Andropogon with Lehua
coffee on left, then more
- 90.9
- 974

Gleichenia and *Lehua*.
lava boulders - clearings.

13 *Andropogon* + *Lehua*.
Glycine clandestina - *Lehua*.
to *Pahoa*

Citrus trees in town.

soft at jet. lava tree
Pahoa - tree mold park.

small cane field just
out of *Pahoa*. Garden with
orange trees, many ornamental,
coffee scattered along the rd.
Exotic trees incl. *Eucalyptus*
robusta. 'Ateler' of *Lehua*.
Then a grove of very large
Albizia falcata.

Ageratum houstonianum
along rd. under these

then open *Lehua* with
deep *Gleichenia*.

Then more *Albizia*, with
great surface roots, or lava
Dense *Lehua* forest, *Albizia*
only along road. Then
almost immediately much
smaller *Lehua*, with dense
Gleichenia (1840 flow). Still
much *Albizia* along rd.

then taller *Dense* *Lehua* and
Albizia along road. Large *Albizia*.

Lava tree park. Stop in
parking lot. In rt. rather
dense tall *Lehua* forest
with tangle of *Gleichenia*

linearis var. *tormentosa*.

Just inside first gate
some planted exotics and
native tree plants of *Albizia*
garavina, *Tibouchina*? *caerulea*,
Albizia falcata.

Nephrolepis abundant now
exotic orchid.

Gardenia remyi planted
just past first lava
trees, and a small *Coprosma*
on rt. in edge of wood (notes)
Diospyros ferruginea & sandw.
on small lava mound
in first group of lava trees.
Planted *Calophyllum*
brasiliense & *antillarum*

On rt. of trail a small
planted *Pittosporum hornei*
in second group of lava trees.
Peltandra on rt.
Machaerina angustifolia.

Open area with many
lava trees. Plants controlled
by spraying.

Plant of *Metrosideros lucida*
(? 187) near little shelter.

At end of loop on rt. a
tall *Wikstroemia*.

Calophyllum inophyllum
but not doing well.
also *Thespesia* seedling.

On left in lava
several Clermontia cf. hawaiiensis?
some small Styphelia

J. st. off trail a small
planted Ruwolzia sandw. (has)
also see Tetraplasandra meindl.

On trail back Machaerina
meyeri, 2 clumps on it.

On left Cassavaea papuana
and C. cf. oligodon.

On rt. off trail Cordia sub.

On left Gunnera sp.

Polygonotis hawaiiensis, small
plant & in crack on it.

Also 2 plants Piper nigrum
on holes, back of them a small
Piper methysticum.

Pipturus on rock scab

Borsigietia papyrifera
where trail comes back to bridge.

Asplenium nidus in crotch
of Albizia ~~between~~ false in
fork of trail at parking lot.

Back of toilet, ~~too~~ Pritchardia
seedlings. Large crack
9' dia.

Around parking lot -
Gardenia jasminoides, Alpinia
purpurata, torch ginger, Asystasia
colored Cyrtolobium, planted.

some Hippocratea as weed.

Monstera cf. "Banana" and
"native banana" both bushy.

Lava free path to Kapoho

Open Gleichenia with
very small lehua on 1940 flow.
Puu Honuaula - wooded
cinder cone on rt. Much
Scorpiurus chrysosanthus on
lava. Very large coffee
plantation on rt. Spars
lehua, Nephrolepis green
on left. Cane field on
rt. Patches of forest in
open lehua on left.
Cane fields.

(stop) Then 1955 vents, spatter
cones, and da glow.
Bouldered area observed
described in 1950 + 1960 has largely
been put in lava.
Plants, Euchitites val.,
lucchesi, Smilis gas., Sonchus,
Cyperus brevifolius, Euphorbia
glomerifera, Vernonia cinerea,
Euphorbia brittonii, Drymaria
cordata, Cyperus compressus,
Digitaria chinensis, Ageratum
conyzoides, Euchitites hisp.
Nephrolepis all very common.
On rocky flow itself,
covered by 1960 spatter.
Nephrolepis abundant
in cracks, fruiting.
(photos)

Puu Kii, to left of road.
cinder cone covered by guava

1st per. from 6.7th

I saw this flow. cane growing in areas not covered. Little but Neptunia or aa. They cane on old flows to Kepohs crater - an old cinder cone covered by guava brush, some bauhin.

Papaya plantation on left. Farms, lavender, not thorns.

Ruins of Kepohs. Cinder cone and cinder beds back of it. No veg. In ruins are old cult. plants of many sorts. The side of Kepohs Crater toward the cinder cone had veg. destroyed or almost so. Small lehuas recovering. Many weeds and ferns. Young lavender.

Gossia alata around parking lot. If low stretches to sea westward.

Eruption Jan. 13 - Feb. 6.
of low covered 19.25 acres (400 m²?)

Road toward sea s. of Kepohs Cr. through cane fields. Breadfruit trees and abu plant bushy on a side of Kepohs Cr. Papaya plantation below crater. Ricinus is abundant.

Lehuas
(new)

new flow on left in distance. Road turns toward sea on old lava. Scattered lehuas. Much Casuarina. Planted to coconuts. Pandanus become common. Beach lots.

1960 flow where it reaches sea. Turn back to take other fork. Pandanus forest toward land from beach lots.

On other fork, older lava dwarf lehuas, helichrysum, P. lucida, on lava flats. Near coast leucosia series dominant. Much lehuas and lava back a little.

Patches of Pandanus. Low low lobelia. Nearer beach mostly bas lava. Some Leucosia, very depressed. Sesuvium in low spots. The Sesuvium has stems greenish above, reddish on side toward ground, glossy lvs., pink bls.

Sesuvium only nearer shore. Much Sambucus cyprea on bar lava. Waltheria, Chrysophyllum, various weed grass road.

Broadleaf woods.

Road comes to Kepohs flow and angles back, through low lehuas & helichrysum to again come road near fork.

photo

brush and sparse lehua.
Other little old trees, some
with cane on outside.
Cane on st of Kii flow.
Lehua across from it.

Pandanus forest at Kapoho
Beach Cots - dense, irregular
solid stand, 10-15 m. high,
canopy open, undergrowth
clothed with young *Pandanus*,
Pipturus albidus, *P. tectorius*,
guava.

Tangled esp. around
edges with *Thunbergia*
stata (white), *Cenavalia*,
Passiflora foetida,
Sporadix indicus, *Commelinaceae*,
Nephrolepis along edges. Molasses grass.
Going back between scrub
more *Pandanus*. Then sparse
lehua with abundant
Perrythra.

Turn on Poipu Rd.

Low sparse lehua with
some *Cassytha*. scattered
small mango esp. along rd.
Out on bare Kii flow. No
veg. Crossed it.
Then more low lehua scrub,
forested to ~~3~~ 3 m. dense,
with *Centrum*, *Diospyros*

Wikstroemia. On older
st. a little lehua,
guava, *coccoloba*. Up h.
Pelandisia, *Laddeeria*
haevoala several.
Pipturus *Cassytha*,
patches of *Pandanus*.

Calophyllum grove. House
& coconut. Clear up
to sea with coconut.
Scrub - guava many
caatinga on it.

Then on both sides.
Coconut grove with
centrum under story
on st. *Calophyllum* grove
on left.

They mixed forest - mang.
milk, *Pandanus*, *Calophyllum*.
Mangrove in undergrowth
of *Calophyllum*.

Calophyllum grove -
Isaac Hale park with
Calophyllum tree, black
sand.

Back of this same
with guava, etc.

Red mixed guava
scrub. forest, etc. Coconuts.
Mang. *Pandanus* under
scrub. abundant
in guava forest.

Low scrub of guava, etc., patches of Pandanus & other forest. More lehua scrub forest. coconut grove. Guava scrub with scattered Pandanus.

Malama - ki Forest Reserve. Ropy Pahoehoe lava with low leucovite on sea side, leucovite, lehua (1-2 m.) + Styphelia on marsh side. Some W. betronics, Cassytha, Fimbristylis, W. althea, Osteomeles, Passiflora foetida, Ischaemum cygnis, Fimbristylis cymosa,

Below rd. a little way saddle, much leucovite, Polystachya betronics, lehua, Ischaemum common. Then a zone of 10-15 m. with just tufts of Fimbristylis and strands of Leycesteria. Then a vegetation-free zone + 10-15 m. wide between salt spray ~~at~~ ends in low spray + splash zone in 10 m. while I was there with no other quiet sea no significant amount of whitewash. Ropy Pahoehoe surface

Photos

From here on considerable Casuarina but well back from sea cliffs. Leucovite on pahoehoe with a little lehua. Then sea with much better veg. Lehua 3-4 m rock admixture of other things.

Much Casuarina around Mackenzie Park.

More lehua & sea scrub forest on es.

Albizia pleurensis
Coconut grove. Back of it Pandanus - betronics, Pipturus, lehua.

Then Pandanus - lehua small cedar cone on left.

Guava forest with Calophyllum grove then less lehua, Pandanus.

* guava + pandanus.
Eug. cumini. Calophyllum. Morinda.

Clearing with guava scrub on left. Coconuts and han.

Mixed forest largely eolian. Coconut grove on rt. tiny village. Opiliwas.

Ape on left. Wind sheared Calophyllum with coconut, etc.

Calophyllum & *Pandanus*.
then with much guava
Lehua forest with Pandanus
some Pandanus on st.
Cleared land grown back
by scrub on left - *Pipturus*,
Plumeria, Guava, etc.

Pandanus on st.

Pandanus forest.

Pandanus - Lehua - guava
Pandanus on left, some
admixture of *Hamelia*,
lehua, etc.

Then 1955 Kaueluan as floor
absolutely bare. (photos 64)
~~#~~ A ~~little~~ patch of Lehua with
a little *Pandanus* ~~on~~
off by a ~~area~~ of fly. Then
mixed guava & *Pandanus*
Eugenia cuminii.

Clearing with giant
Lantana. Then
Eugenia cuminii.

More guava sugarie and
Calophyllum floor.
Guava scrub.

Then ~~the~~ *black* at with
scattered & small lehua
Pandanus forest then
1955 Keokee as floor.

Then ~~the~~ *black* at with
scattered & small lehua
Pandanus forest then
1955 Keokee as floor.

More black as with
scattered lehua.
Apparently only, thinly
and not completely
covered by 1955 flow.

~~Kipahulu~~ of lehua
Lehua forest.

1955 Lehua as floor
small *Hibiscus*.

~~Coptosap~~ *Grewia*
brush - with some *Pandanus*
esp on left side.
Guava forest.

Open lehua forest ^{1/4 mile} or
in *Neurolepidis* & *Leucosia* &
Typhella. Farther on
Wilestronia.

Extends some distance,
gets lower, to 2 m. then
3-4 m. or 5 m. low again.
Then very low and
sprawls 1-2 m. and after
savans bows *Andropogon*.

Then denser again but low.
Spathoglottis all along the
line and more mixture
of *Wilestronia* and guava
suddenly guava scrub
for short distance.

Then over lehua on rd.
on left almost tree as 100 m.
to sea.

Then low guava scrub
with scattered trees

of banana, mango,
Guava. Trees of Casuarina
Coconuts.

Jct. Kaimu Beach.
Coconut grove on black
sand beach flat.
at Pohuehue scrub. Guava
Coconut grove on it,
Guava scrub on left.
More Pohuehue scrub.
Then Pandanus & Pohuehue.

Coconut grove
Kolapaha Pahoa
village. Wind sheared
Cuechia scrub & taller
tree scrub.

Around park - Pandanus
and Aleurites trees open
scrub.

In edges of pond - Bacopa
monnieri, Eclipta alba,
Hydrocotyle vulgaris?,
Commelinia diffusa,
Paspalum
Polypodium scolopendria,
Luehea odorata
Emilia sonchifolia little back.

On dunes 6-9 m. high of black
sand mostly Ixoraea
ps.-casuarina, Cyanothamnus,
Stenotashium americanum
Digitaria henryi, L. sp.
Xanthium,

Panicum sp on sand
around pond back of dunes.

Bath to Pahoa by upper
road.

Guava brush, with
Pohuehue along road
then Pohuehue with
scattered small Eugenia
and a few mango on
smooth old lava.

Then an ar. flow
with lichens and
widely spaced Lehua,
6-8 m tall, Nephrolepis
very epaxic, locally
dense.

Then guava brush
with scattered mango,
large guava with
larger mango. —

Then Lehua open scrub
forest.

Guava, mango, with
vegetable houses with
other trees. Nephrolepis
along rd.

Then guava scrub.
Then with some mango and
Lehua.

Then to open Lehua
trees to 6 m. Gliricidia
and Antipodaea - Spathoglottis

and other orchid.
Then to dense but still open lehua forest
some of it rather tall
tall.

Clearing with sparse
gravel and Andryline.
Mango trees.

Then fairly good lehua
forest 10-15 m.

Kealohahans forest reserve
Dense 15-20 m. lehua with
Fragaria etc.

Then 1955 Kehena flow
covers & left. Some striking
bifurcations, esp. on right.
Lehua forest.

Opposite road.
Lehua forest with Abotium
steam crack on left,
then Kamaili vents of
1855 eruption on rt. Spatter
cones, skeletons of lehua
killed by gas. Other lehua
below were apparently
killed but have now
put forth abundant
short branches. (photos)
Nephrolepis abundant
prob. N. hirsutula.

Plushes, Pitcairnia
Jasmines, Cornus, coffee
Ageratum com., Starlyx
dichotoma abundant
roadside & in clumps.

Good dense tall lehua
forest, out with some
strawberry grass.

Then smaller lehua with
Gleichenia, then tall lehua
again. Some small
bamboo, & nutilite plant.

Good lehua forest
for some distance, with
Abotium large,
(being subdivided as
Leilani estates.)

Coffee plantations - don't
look healthy. Cane fields
with patches of lehua
with Gleichenia and of
dense lehua forest.

More coffee on left.
Village and intersection
with Kapoho Rd.

Mar. 18 - KMC - Park Hg.

Open scrub of Styphelia etc.
with widely spaced small
lehua. Tadorna. patches of
Gleichenia.

Steaming flats - sparse
& dense grass with Vaccinium
moss.

Then ^{other} low lehua forest.
Hedychium along road.
Gleichenia.

March 18 - Olaa - Hills.

Mixed thicket with
kuhni, lehua, Pandanus,
various introduced trees,
Cibotium, *Heterosentus*,
Hedychium flavum, *Pseuderia*,
Malvaviscus, red form
guava of *Acalypha hispida*, lehua,
Nephrolepis etc. in undergrowth
Cecropia, *Helicocarpus*, *Spatho-*
odes

This down to m.p. 5.
Then farms and pastures.
Panicum purpureum,
Nephrolepis, etc. with
thickets, mango and
eucalyptus trees.

Pandanus forest with
guava, etc. on rt
Then mixed bush, largely
guava. Very industrial
district.

Open residence area with
many ornamentals.

Farms nursery.
Pandanus on ~~right~~ ^{right} guava
scrub. More industry on left
Airport Jet.

Going into town large
open area cleared by tsunami

above ft.
of 2 parallel
roads
at corner
between
industrial
on rt side
widely
spread
for road
mill
and
water
treatment

Hills to Culani

Out Rd., Volcano Rd. past
Vanda nurseries midway, etc.
industrial area.

Pandanus thickets with grass,
etc. Farms.

Stairback Hwy. —

Mixed thicket with
guava, *Helicocarpus*, *Cordia*,
some lehua, *Poaoides*
lined with *Pluchea*.

Waimea Forest Res.

Melastoma abundant
along rd. with *Helicocarpus*
about 4 m. tall. Some *Pluchea*,
open lehua behind them.
Some *Spathodes*, some guava.
Cibotium.

Then better lehua forest
with *Cibotium* under
story. Rather open and
brushy.

Occasional *Rhus javanica*
along road.

Then open scattered large
lehua with *Gleichenia*
and *Cibotium* larger.
Locally lehua is denser.
Occ. *Lipturus*. Still
much *Melastoma*, *Pluchea*,
Andropogon along rd.

On right better forest
a little way back from rd.
Stealthily climbing.

Melastoma drop out
and forest improves
but still is a rather
open forest. *Pithecellobium*
still common.

Cibotium prominent.
Lehua tree large but
not dense. Sec. *Fernernetia*

then forest more open.

Fern layer dense.

Occ. planted palms
Forest very

Volcano rd. to left.
Forest very open. becomes
very brushy with
young lehua!

Stop at crossroad
and old flume. borrow pits.
Plants in borrow pits:

Lycopodium cernuum
Eupatorium riparium
Machaerina meyenii
Gleichenia linearis n. *tomentosa*
Faddeia cyathoides

Pithecellobium

(other seeds)

Stachytapheta rich.

Andropogon

Sphenomeris chinensis

Nephrolepis exaltata

Tritoma

250±

Plants in degraded forest.

Coprosma

Psychotria (strumosa) hawaiiensis

Cibotium chamissoi

Metrosideros

Cyanea

Psidium cattleianum f. *lanceolatum*

Antidesma platyphyllum

Broussaisia arguta s. *pellucida*

(a.) *Pilotura* sp. ~~sp.~~

Fragaria arborea

Polypodium saffordii

Xylosma

Nephrolepis cordifolia?

Alyxia olivaeformis

Ilex anomala

Rubus rosaceifolius

Peperomia sp.

Hymenophyllum

grammitis

Vaccinium

Pelea sp. *clusioides*

Elaphoglossum sp.

Machaerina meyenii

Cibotium glaucum

Pterotis sandwicensis

(200 m. on road & n. or rt.)

Cibotium menziesii

Eupatorium riparium

Commelinia diffusa

Lycopodium cernuum

Gleichenia sp.

Grassiflora edulis

f. *ligularis*

Walls in & rt. & top of
forest small riv.
Psyphostria on rt. also along
down shot slope - *Eleocharis*
Cyperus on left.

Note striking variation
in leaf size, shape, texture
pubescence, infl. pubescence
in leaves.

Nothing different on
road in other direction.

On rt. the forest continues
to be open and filled with
Gleichenia etc! *Cibotium*.

Group of *Pritchardia* on
left and on rt.

Forest here about same
but with *Gouldia terminalis*,
Pipturus, another species
Athyrium sandw.

Thelypteris cyathodes,
Chenopodium,
Gleichenia glauca

From here along Pritchard
occasional *Pipturus*
abundant shrub at edge
of forest, also *Coprosma*,
Pluchea, *Hachijaphila*
still abundant
Treyariella abundant,
Tetraploa very rare.

n7.3 Road to rt. Then w & left

n.2

Forest improves.
High, rather dense lehua
With thick undergrowth.
Cyrtandra & sp. abundant
Piperomia abundant
Trichomanes bauerianum
Mysorea cf. sandw.
Fabodesa sp.
Saddleria concolor
Gouldia terminalis
Drypis sp.
Coriogramme?

Forest about 10 m. tall
very mossy below,
a tangled of fallen trunks
Cyrtandra broussoneti
Gouldia and ferns
abundant in undergrowth.
Lehua (*Chiodendron*)
form closed canopy.

Buddleia common along
road, with *Acacia*,
Pipturus, *Tritoma*,
Andropogon, *Madrasina*,
meyeri, *Eupatorium*

Couperia capudensis,
Cyperus sp., *Luzula*, *Fuchsia*,
Pluchea (not common now),
Coprosma, *Lys. cornuta*, orchid

31.9 Forest becomes lower + sparser,
few larger - *Libatium*, *Indigofera* -
+ *Gleichenia* better developed.
no more palms.

32.4 (4692' el)

32.9 Better forest but still rather
open canopy.

32.0 Rulani Camp gate.
Low lehua forest.
Cyrtosma. *Rubus* sandw.

5360'

53.0 Inside or cleared ground
hadleria,
flyphelia
Dysopterys
Machisima
Cypris. sandw.

grass with scattered
big lehua.

Then open to closed lehua
forest. *Chenopodium* etc in
second story
Ferns - hadleria + lit.
under this.

more closed but lower
upward.

40. 90% *Cyrtosma* sandw. at gate.
Forest good. some hoa.

hoa becomes dominant.
Myoporum abundant.

Gate at. 5320'. 1942 flow
Ra lava gray with
lichen - *Stereocaulon*.

Polyphodium pellucidum
Cyrtosma ericoides
Labidibia secalis,
Metrosideros

Epilobium
Vacc. ret.

Vacc. berberid. coloratus
mostly on disturbed place

Kipuera just inside it at
over 40'. has low
open scrub forest of
lehua (*Maurandya*)
and a mixture of
Deshambus + *Cyrtosma*
ericoidea on ground
trees 3-5 m.

flyphelia
Lyc. nemoribus
Gahnia fm.
Phlegmariurus chrysophyllum,
Gleichenia fm. on
hadleria

Carex *Jaachne*:
Fragaria *Lyc. ciliatum*
Vacc. ret.
Vacc. deb?

This ridge about
like forest just outside
flow open grassy
low lehua. Myrsinace.
Hypericum japonicum.

In decadent forest
considerable destruction of tree.
Cordyline. *Rubus* and
Mycoporum. *Coprosma*
~~Chionanthus~~ *Chenopodium*
but *Cibotium*,
Drimocarpus pal. saddle
out is going fast.
Illus. of what happened
on Maui.

Lehua forest outside
middle path - aralia
Diphyllis in open spots.
Stop once here.

Just drove over - in
cleared area - weird landscape
of saddle and dryopteris

46.3
54.5
57.3
59.1

Gate
down to palms. 2200'
cross road. 2200' (700')
rd. to mt. view.
Brown deer forest - scattered
leaves, thickets of *Coprosma*,
Capturus, *Glechoma*, *Cibotium*

Then open area. Then
dense young lehua.
Then leaves land,
abandoned farm, etc.
Heteromeles, thickets,
Glechoma, *Cibotium*,
tall palms. Patches of
rather dense small lehua.
Cleared area of *Andropogon*
+ scattered over small
trees clumps of sapling
and *Glechoma*.

Then open regrowth of
lehua - *Panicum purp.*
+ *Glechoma*. Grav.
Then cane fields.
Several plovers.

62.0 Highway.

March 18 - just outside below
1942 aa lava flow on
Kulani-Mauna Loa Road
in open ~~Metrosideros~~^{Metrosideros} forest on old lava.

41. 41a. *Coprosma ochracea* var. *rookiana*
occasional in understory
40a. *Vaccinium cedrorufifolium* J.
common, with *V. reticulatum*

March 18 - ~~saw~~ kipukas in
1942 aa lava flow near
Kulani-Mauna Loa Road.
in low open Metrosideros
woodland with *Deshampsia*.

- 2 41a. *Gahnia javanica* galiniformis
common
2 42. *Coprosma eremaeoides* Gray
abundant, forming a
large proportion of ground cover
2 43a. *Coprosma ochracea* var. *rookiana* Oliv.
occasional
1 44a. *Coprosma ochracea* var. *rookiana* Oliv.
occasional

1 45a. *Litophelia*
common f. *alba* (Ehrh.) Rydb.

1 46a. *Fragaria chiloensis* Ananassa?
rare

2 47a. *Carex*
rare

1 48a. *Lycopodium venustulum*
rare new sp. name Shantz.

1 49a. *Vaccinium cebulatum*
rare

1 50a. *Vaccinium reticulatum* Sm.
common

1790'
5820'

Oliv.

shrub 2-3 m. tall; fruits
vermillion, fleshy.

clumped shrub 0.3-0.4 m. tall.

1790'
5860'

(and) Heller Oliv.

tufts, nut hanging,
black, glossy.
creeping shrub to 1 m. or more
long; fruits black, glossy,
juicy.

shrub 1 m. tall

shrub 0.7 m. tall.

shrub 3 dm. tall; flowers
white, fruit dull maroon.
petals white; fruit white,
achenes almost superficial.
small tufts

creeping

dwarf shrub 2-3 dm. tall;
fruit dull maroon, fleshy.

dwarf shrub 2-4 dm. tall;
fruit dull orange to vermillion fleshy.

March 18 - Road to Kulaoni
Pison Camp, 2 mi. below
Pison Camp
is dense wet Metrosideros
forest on old lava

41551. *Cyperus haspan* L. sp. nov. to Hawaii
abundant in excavated
area at side of road
3 52. *Abutilon auritum* (Wall.) Link (pink) sweet
common in excavated area
at side of road
1 53. *Hedera Chamissonis*
common in cleared areas along road
2 54. *Pipturus argenteus* var.
abundant in cleared areas along road
3 55. *Fuchsia magellanica* Lam.
also common on roadside
6 56. *Gouldia terminalis* var.
common in undergrowth
3 57. *Triebelmannia* sp. D. Palmer 2/54
occasional, terrestrial,
1 58. *Cryptandra*
rare
1 59. *Nephrolepis cordifolia*
occasional, epiphytic
1 60. *Cryptandra*
very common
7 61. *Coniogramme pilosa* (L.) Br.
occasional, terrestrial
3 62. *Cryptandra*
common
1 63. *Astelia manzana* Sm.
occasional, terrestrial

2800'

shrub 1.5 m. tall, flowers
white; fruit black, fleshy.
shrub 1.5 m. tall; fruit
white, fleshy.
slender shrub 2 m. tall,
branches arching and
pendent; flowers pendent,
calyx red, corolla deep purple.
slender tree 4 m. tall,
fruits dark blue.

~~shrub~~ slender shrub 2 m.
tall, flower white.

seed fruit white.
fleshy

west shrub 0.8 to 1.5 m tall,
fruit white, translucent.
flowers greenish white.

41564 *Stenogyne*
common

5 Mar. 18 - Road from Hilo &
Kulani Prison Camp, $\frac{9}{4}$ mi
below Prison Camp
in moist Metrosideros woods on lava

65a *Thelypteris*
occasional in palm grove

66a *Gleichenia glauca*
rare

67a *Coprosma pubescens* Gray
common

68a *Pipturus albidus* var.
common

69a *Cyathotis (Strawis) hawaiiensis*
common

70a *Coprosma pubescens* Gray
~~common~~

March 19 - Road from Kulani Prison
Camp to Hilo, 1 miles below
Prison Camp
in rather open Metrosideros forest

71a *Cyanaea*
common

72a *Coprosma pubescens* Gray
common in opening

73a *Cyanaea*
common

74a *Antidesma platyphyllum*
common

scrambler, flowers
red purple.

69a
2000'

fronds rather closely
spaced on horizontal rhizome,
fronds tangled, elongate,
glaucous beneath.

slender shrub or small
tree 4 m. tall.

shrub; leaf nerves dark
beneath.

shrub 2.5 m. tall;
flowers white.

shrub, flowers greenish.

69a
1900'

shrub 1.5 m. tall, flower
purple without, ~~pinkish~~
white within.

slender shrub 4 m. tall

shrub 1.2 m. tall, flower
purplish green without,
white within.

shrub 3 m. tall.

100

1961 Hawaiian Is.

41575. *Cyanea*
occasional
3 74. *Hymenophyllum obtusum*
on tree trunks
2 77. *Pselotis complanatum* Sw. ex D. Don
common on tree trunks
1 78. *Grammitis Tonella* Raf.
common on tree trunks
1 79. *Polyodium*
rare, on tree trunks
2 80. *Psychotria (straussii) Hawaiana*
common
1 81. *Peperomia*
common, epiphytic on logs
and trunks
1 82. *Polyodium saffordii*
occasional, epiphytic
1 83. *Polyodium tamariscinum*
common, epiphytic
1 84. *Hymenophyllum revolutum*

March 19 - Helens Pali

on bare lava ledges

85. ~~fern~~ *Plectranthus australis*

rare

^{deco. purp.} *Dryopteris decolorata* var. *decorata*
common87. *Linaria canadensis*common on patches of soil
above cliff

March 19 - Kipukia Nene

88. *Veronica lobata plebeia* R. Br.
in openings

Hawaii

101

shrub 2 m. tall flowers
dark purple without,
bending downward

leaves dark green above,
red with green veins margins
beneath.

680 m.

stem fleshy below,
calyx deep purple; corolla
pale lavender.

900 m.

prostrate, branching mat.

March 19: area bet. KMC and Observatory -
to corner fairly dense low
scrub with

after corner sparse scrub.
almost desert, on loose lapilli
scattered small lehua.

Extinct along crater rim
road about $\frac{3}{4}$ the way to KMC.

Then dense scrub again.

In sparse scrub *Oenothera*
is common, less so in dense
scrub. *Bodkinia* also.

KMC to Chain of Craters.

Steaming flat.

Scrub forest with gleichenia
dense forest on left. To volcano
House. Many ornamentals
around J.H. + residence area.
Yellow ginger + Kahili ginger.

Toward Kilaeua Iki - rather
dense but scrubby. Then
denser and taller - 7-10 m.

Open story of *Cibotium*, large
over on roadside. *Fuchsias*
on roadside.

Beyond Thurston lava tube
parking lot forest is a little
less dense, perhaps lower.

Better *Cibotium* story toward
Kilaeua Iki. Beyond K.I. overlook

road almost no ^{cl.} fern layers
jet. of Chain of Craters
red. damage to forest
from 1959 eruption - to Puu
Manu crater - mechanical
damage from pumice.

Open scrub forest with
shrub layer. Decoloration
notable.

Puhinuu Crater - stop.
Low lehua forest around
it with grass, tufts of
Gleichenia, *Cladodes angustipolium*,
Eporobolus elongatus, *Carex*
macloviana, *Hedelia*, etc.,
Styphelia, *Willestroemia*,
Vaccinium shrubs.

On opp. side more open
with *Gleichenia*.

Nephrolepis abundant on
ledges and top of talus
in crater. *Fragaria* quit
over wall on crater rim, shrubs.

Polybodium pellucidum.

Forest lower and more
open on low road. Shrub
and *Hedelia* layer prominent
(west crater). Farther on
some *Gleichenia*, but local
area only.

Then, near Hiliapale rd,
bubbly open patches ~~with~~ with
scattered lehua bushes
Then section through

an older cove, with indented
scrub.

Low scattered trees - scrub.
Healea Crater on left.

Very open scrub forest
to scrub with scattered trees
Coprosma, *Ilex*, *Pipturus*.
Metrosideros shows more
variation here.

Parahi Crater

Plains grandiflora established.
Dodonaea, *Osteomeles*, etc. Spires
Coprosma erubescens &
Gahnia grass on edge of crater.

Open scrub forest to
scrub and scattered trees.
with *Gleichenia*.

Alo'i Hot area. Steaming good
low shrub grass and
gleichenia, scattered tiny
shrub. *Andropogon*. *Ananas*
Cyathodium cernuum.

Alo'i Crater. Forested.

Andropogon *Metrosideros*
savanna.

Pum Haluhulu on left -

Then open forest with
gleichenia

Alo'i Crater - walls and
talus more or less wooded
glow of lava pool with
very sparse forest.

Clermontia bush on
left roadside just
above Kau Nui o Hams lava
cone sign. Lava bubble.
Hantanea paniculata
on rt.

Then taller forest
with rank *gleichenia*.
Forest gets thicker
just before end of
road. 7914'. *Melastomella*.

Low forest of lehua
around crater. At overlook
a bush of *Gouldia terminalis*
n. antiqua (?) leaves charred
around parking area.
Nephrolepis exaltata
abundant. Weeds.

Machaerina ^{are} generally
common to abundant.

Andropogon general in
open areas.

Dubautia very common.

Alo'i flat started steaming
in 1922?

Hilina Pali Rd.

scrub with scattered trees
Leaves silvery.
low open bubbly rubble
Glyphaea, *Dodonaea*,
Dubautia, *Machaerina* etc.

Much rubble, rocks
with very sparse scrub
scattered trees.

Varies much in density
from open scrub forest to
desert (esp. lower down).

Then an area of open
forest of trees 20-30 m. tall and
up to 6-7 dm dbh. Kipukas here.

Understory of sophora 2-4
m high trees. Much
Commelinia diffusa
Bidens pilosa, ferns
indica, *Pteridium*, *Smilax*
hebecarpa, *C. cerasus*,
etc. On. *Styphelia* + *Dodonaea*
Much *Kohleria* planted. - usually
1-2 m. tall, unbranched.

"Plot" Farther over this forest
is more or less closed

Locally *Styphelia* is
abundant in thicker parts
of open forest and sophora between
3000'.

Then open rubble lava
desert. Then more forest. The
more desert.

Then savanna of *Andro-*
pogon? *Molinis*. *Pteridium*.

Apparently on a slightly old
rubble with more soil
at. Large lehua scattered
irregularly, esp. on the tumuli.

Pellaea *trinervis* very common
in terraces on crevices.

Carex macloviana, *Pilotella*
nudum. *Cladonia* in bare
surface, also *Parmelia*. *Soyptia*.
Many weeds. *Bidens pilosa*
var. white rays.

Kipukas
fairly dense above
with *baphes*.
gets thinner farther on.

Hilina Pali. Great
fault scarp 1500' high,
covered by grass
mostly *Andropogon*
cf. *glomeratus*, *Molinis*,
Pellaea, *Dryopteris*,
redtop ^{reedtop} *Waltheria*, *Bidens pilosa*, *Molinis*,
planted *Pteridium*, *Smilax*, common.
Various other weeds.

On cliff are strips of lehua
forest.

Coastal flat below seems
to be all grassland with
a few scattered bare trees.

Some areas to right gray
and black, without much green.

On ledges of cliff itself on
Lindernia, *Pityrogramma*,
Aphenorhynchus, *Lantana*, *Nephrolepis*,
Goats seen below.

Above pali lehua forest
in both directions in distance
at lower by sparse to quite
dense north.

March 19 - savanna between
Hilina Pali and Kipuha Nene
in open grassland

41589a *Phida* (verbena)

90a *Phida*

91a *Phida*

local colony on pahoehoe

March 19 - Hilina Pali Road
above Kipuha Nene
in open pahoehoe lava ~~lava~~
with scattered big ~~lava~~

92. *Eruodia javanica*
common in crevices

93. *Congya canadensis* var. *muelleri*
common in loose soil pockets

94. *Linaria canadensis*
common in soil pockets

95. *Pellaea ternifolia*
very common in crevices

96. *Festuca myuros*
common in soil pockets

96b. *Bulbostylis capillaris*
abundant on sandy patches

March 19 - Puhiwai Crater

97a. *Carex wahuensis* May.
is rare in low grassy
metrosideros forest

March 19 - Hilina Pali Rd. just
below ~~the~~ ^{south} crater

in open scrub forest

98. *Baccharis pilularis*

99. *Baccharis pilularis* var.
very local ^{? s. miquelianum}

850 "

shrub 1.5 m. tall, very
definitely woody;
flowers dull orange.
(extreme variation in leaf size)

950m.

flowers pale brick red.

flowers white.

tufts

1100 m.

1000 m.

A shrub 1-1.5 m. tall; leaves
thick, stiff; flowers white
with dull yellow tube, turning full
yellow with

from Cut Rim Rd.
Purina area

Mar. 19 - Boardwalk -
Sequoia forest recovering
from fire damage
sending out innumerable
small branchlets on old
branches and trunks.

(Photos) Road covered
by pumice. (not speed limit
sign) *Saddleria* survived
Drymaria & *Cyparis*
Grifolius well developed
on pumice. *Astelia*
and *Coprosma ericoides*
on it a few feet off trail.
More and more dead lehua,
and less recovery. *Pteridium*
on left, then a rd. just before
last living lehua.

Cibotium sprouting, mostly
of last living lehua.

Skeleton forest. Many
fallen trees. No ferns in
this part. Along where
material is scoriaceous,
a few tiny sproutings in the mounds
then a few at bases of
standing dead trees, more
and more near the second plateau.

Then an area where
Rubus rosaeifolius is spreading
in fire recovering forest or cone
shatter. Also *Cy. venosa* &
Cy. baileya, *Loranthus*, *Hamelia*,
Astelia, *Commelinis diffusa*

at Kilanea Iki

this near end of walls.
Views of new lava pool
and collapsed face of
cone from platform at
edge, off road.

Note Bryozoan ledge,
separating Kilanea Iki from
Kilanea Caldera.

Here to Hg excellent
treefern layer in place.
Thick lehua forest t. ocr.
Ilex

Mar. 19. W right Rd. (Rt. 148)

Dense low lehua forest
on rt. *Rubus penetrans*
and R. sp. on side.

Lehua lining.
Clearing with *Syngonium*,
Rubus sp., *Cypressus* ^{lutea}
for Christmas tree.
Cypressus also along road.
Cleared tall lehua forest.
Very open lehua with
well developed *Cibotium*
stratum.

More clearing + low regrowth.
Dense lehua on left,
Opened up on rt. Subdivided.
Then very open and
tangled fibrotium large
on both sides.

Rt. angle turn. Forest
has been cleared to pasture
so

Roberts place.

Pit for cesspool.
Very dark soil at top,
with thin layers of
volcanic ash.

Gradually gets redder
downward till it is bright
red brown. Then suddenly
a firm friable gray layer.

In back - an open
forest of large spreading
lehua 20 m., with an
under layer of libotum
Pipturus
to 3 m.

The *Pipturus* lines
the road perhaps cutting
from opening up.

Tree to rt. - bras. Uncinia,
Peperomia, *Astelia*
and on its base, *Glossyina*
Cyanaea. Some *Coprosma*.

Tragopogon abundant
on ground.

Clearing with *Larrea*
oblongata. A *Pritchardia*
on other side. Many was-

Then trail into forest
again. *Corynocarpus*,
Athyrium & sandw.

Amidst.

Chenodendron on left.
Thysalis fern. in trail.

Cibotium glaucum large,
well developed. *Phalaenopsis*.

Rumex giganteus at first
in trail and on down ^{Penetree} east bank of
D. Thelypteris cyathoides
common. *Athyrium* common
in road.

Friedmannia laevigata
abundant in mossy fallen
trunks.

Astelia, *Elaphoglossum*
birtum, tree ferns, *Cyperaceae*
etc. common shrubs
in lehua. *Chenodendron* also.

Also *Grammitis*, Tree fern,
Asplenium cundatum?

Cryptandra, *Alyxias* etc.

On left br.

Asplenium on trunk on left
50 m. in front bank.

Rubus sandw. and
Vaccinium calycinum var. (also
R. rosaeopolis)

Coprosma on left
(large sp. hairy) at second
ring bank

Solanum nigrum in trail.

Flex + Chenodendron.

other
Weeds in trail

Ludwigia
Cuphea
Loropetalum
Hypericum
Cyperus longipes
Pluchea

March 19 - Wright Road Farm
Lots, just below Kilanea
in *Metrosideros*-*Cibotium*
forest.

- 41600 *Asplenium*
rare, epiphytic
- 1 01 *Asplenium* L. *lobulatum* Mitt.
rare, epiphytic
- 2 02 *Asplenium* L. *falcatum* Lam.
occasional, epiphytic
- 2 03 *Asplenium* L. *falcatum* Lam. var.
occasional, epiphytic
- 1 04 *Phytolacca brachystachys*
rare on roadside
- 2 05 *Budwigia*
in middle of trail
- 2 06 *Peperomia*
common, epiphytic
- 2 07 *Cryptandra*
occasional
- 2 08 *Hebevolvula chamaesianiana* ?
locally common along road.
- * 09 *Rubus*
common in cleared area

1140
4470 m.

flowers, magenta,
stem and leaf veins
purple.
prostrate, forming small
mats.
erect, leaves narrow beneath,
with green veins and
area along veins.
erect shrub 1.7 m tall
flowers white.
shrub, flowers white
with purplish tube; fruit black.
comes primrose erect, 2 m. tall,
floricaso arching and scrambling,
flowers pinkish white; berries yellow, hollow.

4/16/10 *Lotus*
very local in clearing

Mar. 20 - akaka falls

- 2 11 *Psilotum complanatum* Sw. old D. Palmer
epiphytic on mossy metrosideros trunk
- 2 12 *Eugenia*
~~as~~ planted on edge of gorge
- 1 13 *Alnus nepalensis* D. Don
planted on edge of gorge

Mar. 20 - Mauna Loa Strip,
Scenic Drive, above Kipukia Paauhi
in open scrub with koa
patches

- 2 14 ~~Gira~~ *Panicum tenuifolium* H. & A.
very common
- 1 15 *Carex macloviana* ~~as~~
rare, in grass tufts
- 1 16 *Carex macloviana* wahuensis on May.
rare
- 2 17 *Deschampsia ciliata* Hbd. 2 b
very common
- 1 18 *Bromus catharticus*
local in disturbed weedy areas
in koa grove
- 1 19 *Anthoxanthum odoratum*
local in disturbed weedy areas.
- 1 20 *Holcus lanatus* L.
local in trail in shade

forming a dense patch;
flower bright yellow;
"giant refoil".

stem horizontal with
distal parts pendent.
tree 10 m tall; stamens whitish.
tree 10 m tall; leaves grayish
green beneath.

2010.11
6662!

dense tufts

dense tufts

erect

Mar 20. - KMC to Bird Park
and French Road.

Open low lehua with
Styphelia-Vaccinium scrub
Occ. small Santalum.
Saddleria, *Dodonaea*.
Same on road to Bird Park.

On old pahoehoe.

Down hill the lehua gets
taller, still open.

Mauuna Hoa strip, Leleie Pd.
Some admixture of lehua.

Young hoa in mt. Grass
and *Pteridium*. *Sophora*
is the low dark tree. Some
hapu'una. The *Hippocratea* is
on the right.

Then patchy hoa and
large lehua.

Dodonaea is dominant in
shrub layer.

Excellent open lehua
forest with *Dodonaea* shrub
layer.

Then very good hoa
hapu'una forest with
tall shrub layer.

Then excellent hoa
forest in places almost
closed. Occ. lehua and
nois.

Open lehua forest then
hoa.

Koa savanna with
patches of young hoa
forest. Open *Dodonaea*
scrub, with grass
and *Pteridium*.

A *Hippocratea* to the left.

Large area of *Dodonaea*-
Styphelia scrub in
places closed.

Then a patch of hoa
forest. Then irregular
hoa park-land and
savanna, with grass
and scattered bushes,
mostly Styphelia. occ.
Dodonaea. Occ. *Senthera*.

Koa patches, mostly
quite young, in between
grass with *Pteridium*.
Then area with hoa
unproductively, and
some Styphelia.

An a'a flow. Then
more grass and patches
of hoa. Then grass
and bushes. Good
high alt. in fact mostly
Styphelia, at 500'.
Closed to quite open, &
shrub savanna.
Styphelia with a little
dolomiaea.

Patch of open forest,
hoa, shrub, memani.

with young hao above. Scrub with scattered patches of young hao forest, then rather dense, usually young growth around a few old trees. Open scrub on left and between tree patches.

Then scrub with scattered lobbars, a few small hao patches.

Shrub savanna with grass *Pteridium*, *Juglans*, *Thunbergia*.

Aa glow on rd. cross it. lobbars *Styphelia*, *Croton* in patches.

Oxalis roadside hao past with *Dodonaea*, *Sophora* *Mysapurensis*.

irregular but closed hao dominant and reproducing abundantly. Some open grassy areas with *Styphelia*.

Then a hao park land, large spreading trees and patches with grassy intervals, with scattered *Styphelia*.

Then a patchwork of scrub and hao forest patches. Scrub is matrix,

open to almost closed scattering *Sophora*.

Then mixed low woodland of *Sophora*, esp. *Styphelia* patches of dense young hao. patches of *Styphelia* some more scrub than hao.

Aa glow on left then cross it. scattering *Sophora*, *Styphelia*

Then a mixed open scrub of *Styphelia*, *Mauihi*, hao, with some *Dodonaea*, *Vaccinium* a very few scattered small lehrs.

This gets lower and more dense upward.

End of rd. at 6662'.

2) magnificent view of Kilauao, Halemaumau. Patchwork of forest, grassland between here and Kilauao. High alt. scrub in foreground.

Plants in scrub

la *Acacia* hao

la *Styphelia douglasii*

a *Vacc. reticulatum*

g *Deschampsia*.

la *Pteridium*

a *Hypochaeris radicata*

- c *Sophora chrysophylla*
- a *Ptyphelia tenerameria*
- o *Rumex acetosella*
- lc *Sporobolus elongatus*
- c *Pellaea ternifolia*
- c *Coprosma ericoides*
- n *Asplenium trichomanes*
- n *Carex macrorhynchos*
- c *Dodonaea viscosa*
- n Carex sp.
- lc *Gahnia jav.*
- lc *Metrosideros*
- l *Geranium carolinianum*
- l *Anthoxanthum odoratum*
- l *Holcus lanatus*!
- l *Bromus catharticus* (misid.)
- l *Brachypodium sativum*
- l *Plantago lanceolata*
- c *Aira (or Panicum?)*
- n *Verbena bonariensis*

Grove of trees around pavilion.

Vaccinium very variable.

Many pigs in area, doing extensive damage.

2 photos of subt. rest of roll on pig damage.

Goat droppings seen, but not fresh.

Mostly weathered pebbles, flows, pockets of soil.

Mar. 20 - Hilo

Tour of airport, on rt.
a very large jacaranda,
with several trunks, showing
natural grafts.

Hilo - Akaka Falls. 2:30.

cross river -
breadfruit tree on left
coconut breadfruit mango &
gt. Row of small Melaleuca
Royal palms on left above
brink overpass.
sugar mill on rt. note odor.
Road goes along top of sea
cliffs. Gleichenia on banks.
Cemetery on left Cassia glauca
on rt. Cane fields.
Wooded gorge

Second gorge. Breadfruit on
rt on bank of gorge.
3rd gorge. Phalodiodes. Muso.
Casuarina windbreak along
cliffs.

Small gorges with grass back.
Breadfruit here and there.
Mango trees also common
on edges of ravine, and
rough ground.

Cane field + village.
Gibotius much used as an ornamental
small clumps of bananas.
Blue javanica occasional on
edges of cuts + cliffs.

Nephrolepis on road cut.
Eupatorium inquinans
 Hanover turn-off -
 & fine breadfruit trees on right
 as we enter town. Avocado.
 bananas. Breadfruit common.
 After double turn, Macaranga
 macrophylla on left as we
 go uphill. Many *Ephedendrum*
 rebd. Hibiscus hedges.
 Azaleas. Many other ornamentals.
 Cane fields.
 Parking lot. Dense row of
Chrysophyllum cainito besides
 beside lot. Large *Eucalyptus*
robusta, *Albizia* sp. over lot.
Leptospermum under *Eucalyptus*.
Rhus javanica in thicket
 by wall bet. lot and gng.
 Numerous planted ornamental
 shrubs.
 Circle path - turn right.
 Clump of giant *Heliconia*.
 Torch ginger.
Lelaisinella on bank.
 Coffee tree on rt. below bridge.
 Barbosa auriculacea up
 small stream.
 Azaleas. *Ardizia* sp. banana
 almost nothing native
 except one *Lelua*. *Cibotium*,
Psiotum, *Gleichenia*, *Psychotria*
bulweria on cliff opposite
 below falls.

hanover
Dieffenbachia
Physodium sp.
 Pittosporum?
Cecropia (on cliff in front of falls)
Holandra
Costus
 Monstera large vines on
 stairs beyond falls.
 Cordyline - now along path
 + stairs beyond falls.
Melastoma in thickets.
Eupatorium inquinans
Polyscias grif.
Brassava
Impatiens multiana
Alpinia speciosa (beyond falls.)
Eugenia sp.

Lelua grove on top of hill
 and on ridge to Kaluna falls.
 In this second grove note
 a clump of *Astelia*, also of new
Psiotum sp. and *Polyodium*
tamariscinum ^{grahamii} on mossy
 trunks. *Lycopodium* not
Phyllolepthis on arched
 root at branch to toilet above
 Kaluna falls. *Elaphoglossum* sp.
 A small *Dysoxylum* where
 of tree just opp. and beyond grill
 opp. Kaluna falls.
Pteris cretica on steps by
 pavilion.

Rhus jar. on edge of cliff below Kalamu Fall overlook.
Steps along wall of wall back toward parking lot.

Cox.

Giant clumps of *Bambusa*
On trail up, at end of railing about small bridge.
Ophioglossum pendulum
and *Lycopodium hygrophilum*
on lehua trunk

Rhus jar above trail in open pt.

Adiantum capillus-veneris on cut.

March 21 KMC - Kam - Kona. 51133.7435 420

Low open lehua wood, or *Hypelia Dodoneae* scrub with scattered small lehua. Some *boa* reproduction on st. beyond Bird Park Rd.

Beyond camp grounds (eucalyptus grove) bipukas can be seen on hills across depression bet Kilaeua & Mauna Loa.

Mauna Loa viewed forward and to rt. Grassland on lower slopes, scattered trees.

Lehua become sparser
as lava on rt. when road cuts thru the flow - aa bed, on both sides with scattered bushes for some distance - to *Osternotes* occ.

mp. 41

Scarp on rt across lava bed is smooth and grassy with trees in ravines and some spots.

As *Leuca libra*, *Hypelia*, *Vaccinium*, *Dodonaea*

Lehua forest in depression at foot of scarp to right. Approaches the road - also ~~so~~ grassy scarp much closer now.

See patches of planted Eucalyptus on grassy slope of scarp.

End of aa flow.

Old pahoehoe with scattered bushes. Then open scrub lehua forest.

Patches of lehua and of *Dodonaea* scrub.

Rolling grasslands on lower slopes to right, scattered bushes.

On left a loose mixture of *Dodonaea* scrub and lehua thicket.

Cult. pastures to right.

Pahoehoe with rather very sparse irregular scrub.

Lehua trees bleed at tops.

In distance on right Mauna Loa slopes covered by *boa* forest.

- 44 Patch of poor scrub below forest. Sparse scrub on old palochoes.
- 45 Palochos to rt. grassy, with scattered small planted trees.
Then an area where most of trees are dead. Some grass, scrub on left & lower slopes of Mavna too densely wooded here. Most trees on flats to here also dead (planted trees)
Cane fields on slopes to right.
- 47 Beyond here most trees still living. Open brushy pasture with thin *Dodonaea* scrub, scattered small bushes.
Cane fields conspicuous on slopes in distance to rt.
- 48 Old palochoe with sparse *Dodonaea*, on. *Erythrina*, these low, w. scattered bushes 2-3 m tall. Some *Andropogon* and other grasses.
View of South Point ahead. Eucalyptus plantings on cane slope to right.
- 49 *Burtonia* scrub, open to closed, some guava in pastures. Some *Schinus*.

- 51 Grevillea wood break on left, *tamarind* and now grevillea on rt. Heavily grazed pasture.
Another wind break of *Eucalyptus* & *Casuarina*.
Pasture with numerous scattered *tamarind*.
Bantana to left.
Pahala rd.
52 Eucalyptus planted around village. Mill to right.
Grass below village is mostly *Pennisetum maximum*. Many ornamentals in village, 2 large *Cycas circinalis* in rt or road up hill.
(at 151). Above town planted mixed forests and cane fields. Much *Eucalyptus*, now along rd. w. some *Rubus*.
Cane fields. Planted patches of forest on steep slope & left. Planted woods in ravines. Some native woods around head of cirque-like valley to left. Much *Eucalyptus* planted around Chong Village, Kapalapola.
Some native ~~ft~~ trees under *Eucalyptus*.

Wood Valley

Forest around head of this valley is almost pure lehua, large trees 20+ m. 3-4 dm dbh, rather open in spacing, almost completely lacking epiphytes. *Psilotum nudum* seen, but rare. Occ. *Dyschirius hawaiiensis*. A solid understory 4 m. tall of *Cibotium glaucum*, locally abundant locally, *Athyrium* sp. also. *Pipturus* and ? *Iridendron* common around edge. Some *Rubus rosaceifolius*. Many vines, *Sporocarpa indica* etc. around margin.

This forest has an appearance quite different from ordinary lehua forest. It is not var. *incana*, but a less condensed type. The complete lack of moss and other epiphytes give it a thin appearance.

This is on a residual steep slope with rock exposed in gullies and in places on ridges. Soil fairly well developed.

Talus at base of first bank solid with rocks in it has been cleared and planted, very recently to coffee, with catch crop of dry land taro.

- 70.6 Highway, again at Iihala.
2602' Pastures with *Leucaena*, *Pencaena*, etc. *Prosopis*, *Eugenia* go curving along water course.
- 71.1 In open grassland with very few trees extending down gentle slopes toward sea. A green depression between sea and sea.
- 73.2 More pasture with *Leucaena* and *sua*. Very local. Much *Lantana* with very scattered *Leucaena*. Patch of *Eruca* surrounded by *Leucaena* scrub.
- Oa loo*
- Beyond Punahoa rd.
- 74.0 A a lava with *Leucaena*, *Schinus* scrub. Some *Opuntia*. Several of these old aa flows with *Canthium cornuta*.
- 75.2 There a rather fresh very rough aa flow with scattered low lehua.
- 76.4 Extensive low gray *Lantana* scrub on old pahoehoe. Scattered *Canthium* and *Schinus*, *Leucaena*. A few wind-swept *Prosopis* only. Patches of thick *Leucaena* scrub. Some grass.
- 77.7 Rather fresh aa with only

very widely scattered
at low Myoporum, some
Leucaena and P. lucches.

Then treeless grassland
with some Prosopis.

79.1 Hutchinson sugar mill.

Dry slopes, grassy above
but mostly Leucaena
scrub with Prosopis along
road.

Then grass with scattered
Prosopis, on rather steep slope.

80.5 Vast treeless grassy slopes,
with cattle. Treeless
grass with occ. small
Leucaena shrubs.

Small ranch houses with
trees.

82.3 Maolahu.

Sugar on rt. pasture on left.
Then thickets of Leucaena,
with some guava etc.
in places forming a dense
scrub 4 m. or more high.
Village - Waikiki?

84.6 Coffee, orange bar.

Then hills covered by
Leucaena grass thicket
for some distance, occ.

trees of *Hagenia compta* locally
coffee plantations, scattered
Eucalyptus. A little lehua
locally. Much Leucaena.
Lehua becomes more comm.

87

87.0 Open stand of small
lehua, locally much
Leucaena. Planted
Eucalyptus, etc.

Pastures with scattered
medium lehua.
South Point Rd.

Grass brush along road,
pastures with lehua away
from rd. Planted Eucalyptus
groves and rows.

Fairly dense but low
lehua on 1^{1/2} m. flow.
more scrubby and sparser
in places, ranging from
1 to 3-4 m. tall.

Then Kilekuna grass
pastures.

More lava, this rather
bare.

1^{1/2} m. flow is bare pahoehoe
with depressed patches
of *Dubautia* scabra, very
sparse ~~occ.~~ small lehua,
Psilotum nudum tufts,

Styphelia bushy up to
1 m. tall in sheltered spots.

Nephrolepis exaltata
in crevices on cliffs.

Cladonia tufts abundant.

Polyodium pellucidum in cracks.

Rhacomitrium maximum
deep crevices, ledges etc.

Vaccinium ret. rare in
rough places.

Very locally in low spot
a little grass, *Cosyphus*,
Luehea, *Lehinus*, *Hypo-*
chaetus, *Pactusa*.
Rumex - shrub, along rd.

Then apparently slightly
older palochros with
larger lehua.

Then still older, with
grass. Then open forest
with Syzygium & scrub on
aa. trees 3-5 m. tall.
Some *Mycoporum*.

Then bare¹⁸³⁷ aa rock,
grassy heupuka with
scattered larger lehua,
much hching.

On this are a very few
Saddleria, one or two little
lehua. Mostly a barren
black clinker surface.

Being crushed for road metal.

993 Kupuna of older aa probably
1837, with scattered small
lehua.

1907 aa has no plants
but a small heupuka or two
of older lava.

Then as older, brown aa few
with scattered lehua 2-5
m. tall, very gnarled in
some places rather closely
spaced, a few *Sophora*.

953 An older, grassy palochros
surface, scattered
lehua. A humu Patel.

Then a manana woodland
with occ *Dracaena*,
Canthium etc.

Then taller open lehua
forest on aa. No
undergrowth except
scattered *Dodonaea*, etc.
Almost closed in places.

Patches of mixed scrub -
Sophora, *Dodonaea*, *Osteomeles*, etc.
Then tall lehua forest
closed & open, some other
trees, on aa.

Gets lower and thicker.
Then a bare aa glow, 1907
with conspicuous lichen
growth, scattered small
lehua (1 m.), *Saddleria*, etc.

Then older aa with open
small lehua forest, 3-4 m.
tall.

Then larger and denser,
also on old aa. stature
varies locally, also density
and undergrowth.

Then tall dense lehua, after
other trees in with it, but
very few, locally var.
aa. orange - perox.

Mamala Park
grass, with planted trees
both native and exotic,
named. I willim, table, etc.

surrounded by dense tall
lehua forest on very mossy
soil. *Pelecyphora reflexa* common
on new growth. *Nephrolepis exaltata*,
Cosmoulos, *Wikstroemia*,
Pittosporum tenuifolium
on st. just off trail 10 m. is
thin tangled undergrowth
of *Lantana*, *guava*.

Osmanthus about 15-20
m. in. Many small
Psychotria hawaiiensis,
Lippia, a few *Cibotium*,
a tall slender *Reynoldia*,
Alpinia on st. 100 m. + in.
Myrsinaceae abundant
on ground, esp. on trail.

Asplenium sandwicense
on ground. *Linaria cymbalaria*,
Myrsinaceae. *Castadium* -
shrub at end of trail.
Alyxia connivens,
Pelea sp. *Pistotium nudum*
on ground.

Antidesma bunius
Gouldia terminalis
Chionanthus grandiflorus
Polyprop. thunbergii

n. trail.

Coprosma sp. (aff. *famei*)
Lycopodium phyllanthus
Cibotium venustum.
Ophioglossum pendulum (terrestrial)
Rubus rosaefolius
Carex. *Microlepia*
Osmanthus common, also
Psychotria.

Off lava flow, into deeply
weathered soil -
grava brush, well
lower story of *Rubus*
rosaefolius, a few
widely spaced very tall
lehua *Canthium*,
Nephrolepis,
a few young *Psychotria*,
Stachytaphyli sp.,
Cordyline (rare)
Wikstroemia,
Osteomeles anth. (ulei)

tall lehua forest, but
near road much choked
with *guava*, in places
very sparse.
then rough as with
sparse lehua.

Then large area of low
dense *guava* brush with
scattered tall slender lehuas.

forest becomes denser but still tangled with tall guava. Acc. small kubui.

Then open guava scrub. Open lehua with guava and kubui. Then dense lehua forest with some kubui and guava in understory.

Then guava forest with a few, then no, lehua. Some lehua and kubui with guava. Then none.

To stone wall on rt. and rose apple grove.

Patches invaded by guava. Then coffee plantations.

Hoopuloa flora 1926.
aa. scattered small
lehua. Nephrolepis.

Stereoscyphus makes rock gray.
Guava thicket on ~~ee~~.

~~Left~~ rt. coffee on left.
Open tall lehua forest.
Considerable guava in
undergrowth - tangled.
Fragrantie -

Coffee. Cascavering going
on rt. Then patchwork
of guava scrub, lehua,
coffee. Acc. kikui.
Hedychium abundant.

205.4

10.5

Mixed thickets of
guava, lehua, lehua,
mangroves, lime areas
of tall lehua.

Open degraded lehua
forest with area of pasture
Alelia 1919 as floor,
many small lehuas,
Nephrolepis, bushes.

Then tall lehua, closely
under guava and lehua.
Pithecellobium acc. less tangled
farther on. Then
rather open medium
lehua on aa. Thick in
places some kubui.

Then some over pasture,
mostly nephrolepis.

^{Kahuna} 1918 as floor, base except for
Nephrolepis, thinly
near road.

Kipukha visible up hill
on right. Some lehua
forest killed by lava.

Farms, guava, Fourcroya
Vandamus, kubui, forming
thickets, which are around
coffee field and between
farms.

Coffee plantation. Lehua
forest above on right.

Then some on left.

Large open landscape scrub
on left.

then irregular forest,
guava scrub mosaic
Agave. Fowers conspicuous.
Schinus common. Mangoes.

large Ceiba on right
On left pastures on
spectacular Cassytha.
Pastures with Mango trees.
very weedy.

1950 Kaohue as flow. narrow
tongue. Nephrolepis.
Pastures. Mango trees.
Guava - hibiscus thickets.
Aloe school.

Open pastures. Guava
thickets. Samanea and
Guavilla trees. Plumeria
above road, just before
Honokua 1950 as flow. Pao
except Nephrolepis.

Guava thickets.
Cassytha on Schinus on left.
Kukui.

Guava and han. with
hibiscus.

Pasture below rd.
Schinus thickets above
with Cassytha.

few open Ghura with
Lantana undergrowth.
Kukui guava.

A few weedy pastures.
Coffee plantations above
road. Thicket with

Cassytha below.
Injekts both sides.
Kukui above.

~~Garden Cemetery~~
Farms and pastures.
Mixed thickets.
Hookena rd.

These thickets. farms
Albizia lebbek above
road. Lava from school.
farms.

Datura arborea on rt.
Farms with breadfruit
trees rather common.

Mangoes. hibiscus green
leaves. hibiscus thickets.

Pastures - papaya plants.
coffee.

Honauuan road. —

Down it.

Coffee. Mixed thickets
with many. see breadfruit.
Guava - Hibiscus thickets.
coffee. thickets. Kukui.
pastures. Many papayas.
breadfruit common. bananas
one. Pandanus.

Turn down through
weedy pasture with
Melia fairly closely spaced.
farm area around school.
Pithecellobium - Lantana,
open thicket, gets denser
down road. then more open.

some pasture with *Panicum maximum* and much *Pithecellobium*. On Prosopis and *Sesbania*.

Hamelia low scrub and grass
on lava - *Santana*, tangled
with vine. *Cissus quadrangularis*
Hamelia - *Prosopis* - on cliff.

Pithecellobium forest
City of Refuge. Big *Acacia*.

Coconut grove with *Acacia*.

Morinda, *Pandanus*,

Cordyline

Cyperus laevigatus near pond

Ipomoea per-capitae

Fimbristylis cymosa.

various weeds. all
in courtyard.

large *basa*. *Cyperus*
parviflorus under
coconuts. *Fimbristylis cymosa*.

Palaeohoc flats in front
tulps of *Fimbristylis*.

Back of this depression
of *Cyperus* jar.

Beyond last wall,
on berm above flat,
in front of *biana*-
Opuntia forest

Ipomoea per-capitae

Datura metel

Coriaria subcordata.

Passiflora foetida

Cyrtodon dadyanii

Catharanthus roseus

Oenopodium murale

Lada pallax

Waltheria

Euphorbia glomerifera

Pencaena

Morinda

Prosopis is mainly along
beach. Back on flats
Pithecellobium dominant.
spreading flattish topped
trees to 6 m. or more tall,
rather open beneath.
trunk to 2.5 cm. dbh
often several small
ones from base. *Ipomoea*
common. some slender
Pencaena. Average shading
of larger trees 3-5 m.
Ground practically bare.

Plots of *biana*, of
front of *biana* forest
of inside of *Opuntia* forest.

Boerhaavia mutabilis comes
on rocks near first enclosure,
on it, with *Amilia javanica*
& other weeds.

Large *Prosopis* back of parking area.

Leaving by other road.
Cerurus on walls. Entering
village.
~~Trees~~ scrub, of bld.
Pithecellobium, *Sesbania*,
Passiflora quadrangularis.
Open spots or fields with
grass and *Neobromus*.
Low small *samaraea* scattered
here and there, locally
abundant. The others
on lavaflats of Kesi
Battlefield.

On right a low grassy area
with scattered *Prosopis*? trees

Scrub gets denser and
taller, mostly *Pithecellobium*,
on s. higher ground
as field with very little
vegetation.

Village with tall dense
Prosopis. Many planted
trees - *Peperomia*, *Coccoloba*,
Clunium, *samaraea*.

Climb up slope through
samaraea scrub. Some spurs.
Farms, pastures.
Rubra grove's at below.

Main road.

Farms, thickets. Partings
clumps of *lehua*. Coffee.

Mainly coffee planta-
tions fresh here &
captain Cook, Paraguanas
and Jacaranda. Some
pastures.
Large *Datura* & *Bougainvillea*
on it.
Bachor main highway
many houses.
Jacaranda common,
also *Hoplophorus*,
Reahabrus.

March 21 - Napoopos Road

below Captain Cook, S. Kona

91621 3 *Caesalpinia sepiaria* Roxb.
locally common

Mar. 21 - Honauanau, S. Kona

1 22 *Cyperus laevigatus* L.
edge of pond in City of Refuge

Mar. 21 - Manuká Park
in thick ~~tala~~ Metrosideros
forest on aa lava flow

7 23 *Antidesma kapuae*
common in understory

3 24 *Gouldia terminalis* var.
~~occasional~~

2 25 *Afliptenia ponderosa*?
occasional

1 26 *Pelea oblongata grandifolia* (H.Bd.)
rare

1 27 *Psilotum nudum* (L.)
common on mossy rocks

1 28 *Ophioglossum pendulum*
var. ^{mong.} _{galeatum}
rare on fallen log

1 29 *Carex brunnea*?
rare on mossy rocks

1 30 *Polypodium thunbergianum* (L.) C. Chr.
rare on mossy rocks

1 31 *Gouldia terminalis* var.
rare

3 32 *Peperomia*
common on mossy rocks

380
400 m.

scrambling prickly
woody vine; racemes
erect, flowers yellow

0 m.

500 m.

small tree, sterile.

slender shrub 3 m. tall,
flowers green with
top dark purple tubs.

slender small tree, sterile.

St. John's wort slender sparsely branched
shrub 3 m. tall.

(small) C. Chr.

shrub 1 m. tall; fruit
black when ripe.

leaves subflexed, green &
marked with red beneath.

March 21 - 1868 lava flow,
east of Waiohinu
~~is~~~~at~~ roadsides on
pahoehoe lava
Rumex gigantus

41633

March 21 - Wood Valley, Kau District.
n. of H. Pahala 800 m.

4 34 *Dodonaea viscosa*
occasional

2 35 ' common at lower edge of

3 36 *Pipturus albidus* (H. & A.) Gray
common at lower edge of

8 37 *Selaginella* ^{orthocaulis} (Kunif.) Spring
mangostana
abundant on floor
of forest in ~~wooded~~
area of exposed rock

March 22 - Kahaluu Forest
Reserve, Hualalai Road

3 38 *Vaccinium calycinum* B.M.
occasional in tall wet
Metrosideros forest.

March 22 - Keauhou, on Hualalai
Road,

in thin ~~td~~ Metrosideros forest with
mosses as lava.

2 39 *Myrsine sandwicensis*
forming an open shrub layer (400 ft.)

500'

800 m.

low spreading tree
with distorted branches
shrub 2-3 m. tall, no
silk, almonds red when
broken; sterile.

shrub 3 m. tall, leaves
greenish white ~~as~~ beneath,
veins somewhat reddish,
not on same plant.

320 m
2700'

sparingly branched erect
shrub 3.5 m. tall; fruit scarlet.

1060 m.
3500'

shrub 1.5 m. tall.

1901 Haw. Is.

Mar. 22 - Captain Cook to Hualalai
Farms + houses, many
ornamentals - jacaranda very
common

Capt. Cook to Kauhou - coffee
plantations - mango tree,
bananas, palmaya, *Persea*
or *Pandanus*. *Kalanchoe*
very abundant on banks.

Lehua forest on st. just
at turn up hill.

Coffee to 1st get.

Lehua forest, groves thicket
Mayonotia at first.

Stand of *Tournefortia* along ad.
Some moss on trunks. *Cibotium*
Pipturus abundant. *Broussonetia*
Lehua to 125'.

Stop at 2000-2200'.

a *Metrosideros*, *Aygod.*

c-a *Lysimachia hawaiiensis* (second ad.)
Pennellia

Cibotium char.

Pipturus albidus

Fragaria ~~anana~~ *lavae*.

Cyatandra

Broussonetia

Peperomia

Antidesma

Alyra

Hymenophyllum var.

Phelip. cyath.

Clad. retic.

Trichomanes

The epiphytes are mainly
down in the lower few m.
of the forest

Psilotum nudum
Vaccinium cal.

Tangles of weeds
along rd.

Up about 3000' forest
of somewhat lower stature.
Pittosporum *wormeri*(?) or *lept*
on flat ground. Less *Psychotria*
here. Less *Lythrum*.

Frasera mexicana plantation
in large clearing
Top of clearing is Kahala
forest above line. (40" no rainfall.)

Much lower lehua 10-15 m.
more open Gleichenia.

No epiphytes. Dry. tal.

Cyanoa very common.

Experimental clearing 3400'
Thin dense but small
lehua with no epiphyte
except in lower m. of banks
canopy thin - thick

2x better

Moss layer on ground
spacing of trees 1-2 m.
Lys. cernuum abundant
Machaerina Hed. glomerata
Isochne styphelia.
Myrisina sandw.?
Lycopod. venustulus
Nephrolepis exaltata
Sphenomerus
Styphelia tan.
Hedypt. cyath.
Coprosma sp.
Gaulnia juv.
Nephrolepis cordifolia
Poly pod pet.
Rubus sandw.
Alyxia
Leptosoma
Liparis
Actelia

Trees very rapidly diminish
and open up. Subtropical
little moss. Copr. errad.

Becomes open low woodland
not over 6 m. tall at about 4250'
boundary.

Styphelia scrub with
tiny lehua trees 2-4 m.
Coprosma errad. *Dodonaea*
Vaccinium Dubautia 2-4 ft.

5000'

5500'

On an very thin scrub
with sparse lehua.
 Runex rare 45-4600
 Moss only in ravines
Exacarpus ^{surprise} & *Sophora*
rare at 47-4800.

An older soil, deeper,
grassy with leua, *Sophora*,
Santalum, *Myoporum*,
badly grazed, many trees dead.
Mystroxylon.

Open grass. Koa.
 Koa-lehua savanna
 then lehua.

These on lapilli soil.
 Styphelia-Dodonaea scrub
with scattered lehua.
Sophora, rare.

Verbasium abundant
Santalum on lapilli soil
in loose Styphelia scrub
with mamaki. a few
 lehua, some mai, locally
Coprosma mai. C. ~~errad.~~

Myrisina
Trisetum ^{Collae.}
Cyperus

Carex macrostachys
Pianella
Wikstroemia
Osteomeles

Scrub more luxuriant
really open scrub forest,
on cones.
Lapilla beds. scrub very
mixed.

6500' ^{especially} ash on pahoehoe
spectacular lava walls
laminated from rolling.
Lava river in a gorge
with rolled sides, when
in place. Lefuanas,
Styphelia, luxuriant
in them. Stereogyne.
Scrub on ash very sparse
with scattered Lehuia.
Cone nearby - Kamalo ~~ash~~
very sparsely vegetated.
Those on ahead less so.

Brown aa. partly covered
by brown fine lapilla ash.

Lava cones, lined by spatter
on parts.

- a Styphelia
- c Coprosma mont
- a Podocarpus
- a Dubautia
- d Hediondium
- a Pellaea
- a Vacc. ret.
- c Geranium
- c Deschampsia

- a Epilobium
- c Coprosma ericoid
- c Galenia
- n Euphorbia nivis sp
- n Asplenium buckmannii
- c Polypod. pel.
- n Polypod. thunb.
- n Haemula sp.
- n Gestaea myuros
- n Tetramolopium

low sparse scrub, denser
at in ravines and in cones.

Up hill scrub is much
more dense

"Vernal" grass with
Veronica fine yellow soil
but. as fragrant.

7600' oasis of Megopomum
Lophira etc.

- Taretes munda Cirsium
- Coryza bon.
- Hypochoeris
- Geranium
- Epilobium
- Verbascum

- Pteridium
- Frisetum
- Tetramolopium abundant

Top saddle spars
Styphelia scrub Dodonea
little lehua.
Ponded patches
Curves ad rampart

Drying \Rightarrow Sophora pred.
on grassy lava slope.
Many planted Eucalyptus.

Small cone with
well dev. crater.

Epilobium
Verbascum Graphium
Hypochaeris 2 m.
Sphyrnum
Verbena bonariensis
Rumex acetosella
Holcus? Tagetes minuta
Asplenium trichomanes
abundant:
Asterium
Sophora
Dodonea
Pellaea
Deschampsia
Trisetum
Luzula
Styphelia

Saddle
backed
cinder
cone
volcanic
rampart
quartzite
4000'

Same flow - aa - on way
down, scrub, scattered
mamane + lehua.

Slope down is scrub
gradually increasing in
ht. To 2-3 m. down to cluster
of cones. Scattered Sophras,
but very few lehua.

Stations low again as cones
are approached. Tide of them
toward Hualalai rather
barren, sparse scrub.

On sea side more moist
open low lehua forest.
Mosses on ground, even
below in scrub with
scattered lehua.

Top dry ground are.
Copro. erinodioides abundant
at crater about 300' across
and deep.

Veg. of Cyanoa, Pipturus,
Flex? belleria, Dryopteris
palaeae, and a very long-leaved
Dubautia.

Around this - open scrub
with some lehua. Geranium
close to Kapulehu big. lts.

Telephone station
Kapulaha. 2500' ±
Xenolith exposure.
Collapse pit with great
mass of Xenolithic nodules
coated over with 10-15
cm. Pahoehoe

Grassland of *Pennisetum*
on pahoehoe flow.
~~as~~ bare in places except
for scattered Lehua.

v5.2

Grassy slope on older lava
just above highway
scattered dry forest trees
Chen. oahuensis. *Uncaria*.
at Kamakuhin
some *Grevillea*.

Road to Kona - savanna
of *Pennisetum* with
Grevillea + some native trees,
Lophola, etc.

Then reflected land
mostly *Grevillea* form
pasture. *Pennisetum* local.
Melinis.

Lava on coastal flats
black - flows very
striking.

- Small farms. guava
brush. Thickets. occ.
breadfruit, mango.
Coffee on it.
Guava brush. Pastures.
70.8 Hauula Rd.
Coffee and guava. thickets.
mixed thickets for some
distance.
More farms
73.2 Head to left.
low mixed scrub below.
below with the sisal.
Scrub drier & drier.
Then over *Prosopis* with some
lehu and some *Leucaena*.
75.2 Kaihue - airport - volcano jet.
Large banyan, to left.
beyond on beach road -
Prosopis, *Leucaena*.
Beach houses.
Leucaena with *Prosopis*.
Along coast. Some good
Prosopis forest on left.
Much *Leucaena* scrub.
Coconut groves at Kahaluu Park.
Prosopis-savanna-Pithecellobium
- lava flow - as - bottom of
experimental lawn. Keaham
switchback on flow.
Capparis on top.
Leucaena - shrubs in as
forms. + thickets. Kalanoku
84.4 Main rd. thickets & farms.
85.1 mixed scrub. *Reynoldia* on it.

Alexandra Palm - Iaoa

For Waipio trip - start early
as fog comes in after noon.

Follow ditch trail around
heads of valleys.

Come out at Pau Alaa
where cars can get into
edge of forest on Water authority
Road.

State dev. Forestry 6 jeeps
S.C. 8.. several jeeps
Bishop Estate. 2 jeeps
Northrup Castle 1 ..

ctd. open patchy lehua
with Santana, etc.
bamboo.

95.9 Hokualoa Rd.
Much coffee.
Open lehua.
Bamboo & coffee

Temple on rt. Buddhist. Kailua

left Macaranga monophylla

Blightia sapida on rt. just
before hospital. Kealakekua.

summary of Hualalai Rd.

Up Keauhou I., through
coffee on lower slopes.
into Kahaluu Forest
Reserve, into wet forest
of magnificent Lehua,
to 4000' with second story
of Psychotria hawaiiensis.
20-25 m. much wet
undergrowth.

This more or less the way
to big clearing, perhaps
somewhat lower station
up ^{toward} clearing.

Top of clearing, at 3400',
Lehua forest remains, but
becomes lower. On up the
road it is lower, less
epiphytes. To second clearing.
3500'? Here forest is much
lower, dense but with
very open canopy because
crowns are so narrow.

Epiphytes all non-vascular,
bryophytes only on basal
1 m. or less of trunks, crustose
lichens farther up. The
ground has a thick moss
layer, ^{moderately} with Hypnodendron
cernum and other pteridophytes.
florib. layer of Myrsine.
Isocoma distichophylla common.

Above this the forest rapidly
diminished in height and

became more open, less mossy, with *Coprosma emodoides* and *Dodonaea*. At 4250', the upper boundary of Kauaihou, it has become a low open woodland not over 6 m. tall. By 4500' it has become a *Styphelia*-*Dodonaea*-*Vaccinium* scrub with scattered 2-4 m. lehua.

At 4550-4600' the road goes over an aa flow with very thin scrub and very sparse lehua. *Eriocarpus*, *Mysrsin*, *Sophora* at 4700-4800' but very rare.

At about 5000' the road comes out on the edge of a broad flat area of an older deeper soil - grassy with *Iroa*, *Bartsia pilgeri*, *Myoporum*, *Mysrsin*, etc. badly grazed. Then open grass, then *Iroa*-lehua savanna, then sparse lehua. The soil from here is of yellow-brown lapilli somewhat larger than pea size. Up slopes of *Styphelia*-*Dodonaea* scrub with scattered lehua, *Sophora*, *Myoporum*. *Verbascum thapsus* is very abundant.

This becomes looser and lower, *Sophora* a bit more common.

Bartsia pilgeri? occasional, *Coprosma emodoides*.

Then up hill on lapilli beds. On such cones as the one east of Kauaihou, the scrub becomes more luxuriant, really scrub forest. On lapilli beds a very mixed scrub. At 6500' south of Kauaihou, on left of rd. spectacular rolled lava "snowballs" and a "lava river" or mawae, a gorge, becoming a tube in places. In this luxuriant vegetation of *Styphelia* and some lehua.

Cones, beginning with ~~Kauaihou~~ less and less vegetated, rather barren.

Then ~~an~~ ^{brown} aa flow partially buried with brown fine lapilli.

At about 7150', n. w. of Poipahu, in open scrub in a mawae lined by spatter ramparts, a scrub 1-1.5 m. tall, mixed *Geranium cuneatum* small plants rare in other bushes.

An open to somewhat dense, low to tall scrub covers the passes and cones in the area from here to highest

saddle at just under 2000' on Puu Hualalai, n.e. of Hamoa crater.

On the west slope there are a very few lehuas, mostly a grassy lava slope with an open, but dying *Sophora* forest, much planted *Eucalyptus* to take its place, not very large.

At about 7500' a small one has very little vegetation. The general aspect above this is sparse scrub, with almost nothing on a pond lava flow at 7700'.

On the west slope between 7500' and 6000' the scrub remains about the same except to increase in stature till it is about 2 m. tall, down to a cluster of small cones above the Kauapelehu flow. These, on the east side, are rather barren, on west side a low but rather dense lehua forest. This at about 5700-6000'. At about 5500' the vegetation is an open scrub, especially of *Styphelia* with some scattered lehuas. A thick soft moss layer on ground, *Luzula* are lit crater.

From here down the road follows the Kauapelehu aa flow, with sparse fairly lehua, the only under ^{lay} growth of patches of *Nephrolepis*. Very rough.

This extends down to just above the Telephone relay station, which is on grassy to bare pahoehoe. Kenolite station.

Below this a grassland of *Pennisetum* on pahoehoe flow crosses a bare aa flow into more grassland with scattered planted guavilla and dry forest trees.

166

(cont'd. from No. 148)

1961

Hawaiian Is.

41640

Scleropinella anomala (Kauff) Sprague
common in deep moss

same

in open metrosideros forest

41

Myrseis

rare

1850 m

4000'

March 22 - Keauhou no. 2,

on Hualalai Rd.

42

Rumex giganteus f. coeruleostrob.

rare on aa lava flow

in very sparse vegetation

43

Exocarpus gaudichaudii A. DC. (s. str.)
occasional

1850 m

4600'

1450 m

4750'

Mar. 22 - Flat southeast of

Waha Pele, Keauhou no. 2

44

Santalum ellipticum var. *pilgii*
common locally in savanna

1800 m

5000'

Mar. 22 Between Waha Pele and

Pun Ihauha,

in tall scrub

45

Santalum ellipticum var. *pilgii*

46

occasional

1600 m

5300'

1450 m

5100'

Mar. 22 Southeast of Waha Pele

Keauhou no. 2.

47

Dodonaea viscosa

48

occasional in open th. savanna

Hawaii, Hualalai

nati. Kong

167

erect, somewhat revolute.

erect shrub, m. tall,

flowers and especially young

fruiting calyxes scarlet.

low broom-like shrub, pubescent

tips maroon; fruiting

receptacle globose, yellow,

fruit maroon.

spreading tree 4 m. tall,

leaves rather glossy, pubescent

dull yellowish green; flowers

greenish, fragrant.

shrub 3 m. tall, leaves

dull yellowish green

spreading tree 4 m. tall.

- 4/16/47 *Mysore*
 1 common, forming grove
 42 ~~sooty~~, *Mysore*
 13 ~~sooty~~ occasional in open flat

March 22 - between Wahre Pole
and Puri Ikaaka

- 4 49 *Santalum ellipticum* var. *pilosum*
occasional in tall scrub
3 50 *Coprosma montana* Hbd. var. *montana* (Asperula)
occasional in tall scrub

Mar. 22 - between Puri Mounds
and Puri Ikaaka, S.E. of Kamunoda

- 3 51 *Santalum ellipticum* var. *pilosum*
occasional in scrub
on lapilli ash.
2 52 *Rubus giganteus* cf. *coccinea* T. & G.
rare in scrub on lapilli ash

Wahre Pole

- 3 53 *Coprosma montana* Hbd. var.
occasional in scrub
4 54 *Wikstroemia*
occasional in scrub
3 55 *Santalum ellipticum* var. *pilosum*
occasional in low scrub
3 56 *Excoecaria gandharvii* A. DC. (not in)
occasional in scrub
4 57 *Cyperus hillmannii* Benth. L. & V. (not in)
occasional bare ground in open sun

169
5300'

- shrub 2.5 m. high, leaves
stiff yellow-green, fruit immature
shrub 1.5 m. tall, ♂.

169
6300'

- shrub 2 m. tall, leaves
dark dull purplish green,
when old, light green, when
young; flowers green, fragrant
shrub 1 m. tall fruiting
calyx red; flowers red with
white style.
~~stiff shrub~~

montana
(dead leafed
form)

a
dead
leafed
form

- stiff shrub 2 m. tall,
fruit orange, juicy.
low compact shrub,
1 m. tall, flowers yellow
shrub 0.4 m. tall, flower
yellow-green, fragrant,
fruit black, juicy, when ripe.
low bush 0.6 m. tall, spreading,
tips maroon; fruit red, receptacle
yellow.

170

1961 Hawaiian Is.

Mar. 22 - just south of Kamuela
in open scrub on ash

- 41658 *Tetramolopium*
rare
- 5 59 *Stenogyne*
rare, in small lava
ravine tangled in small
Metrosideros shrub
- March 22 - Pass n.w. of Poikali
in scrub in shallow ravine
- 60 *Tetramolopium*
rare
- 1 61 *Trisetum glomeratum* (Kunth) Trin.
rare
- 2 62 *Luzula lawii* Gray
occasional
- 3 63 (grass) *Sporobolus africanus* (Pursh) Röhrs
spinosus Willd.
common
- 1 64 *Geranium cuneatum* var. *cuneatum*
very local, in stiff shrubs
where goats can't reach it.
- 1 65 *Asplenium trichomanes*
occasional in crevices in lava
- 1 66 *Asplenium adiantum-nigrum* L.
rare in crevices
- 1 67 *Veronica supellifera* L.
local, in desiccating pool.

March 22 - east Kualalai,
below summit
on ~~spar~~ spatter cones

- 1 68 *Pteris*
rare in small Myoporum grove, grayed

10,000'
6500'

Hawaii, North Kona, Kualalai 171

7,500'
7100'

tiny tufts.

Tangled herbaceous vine;
flowers bronze-brown.

tussocks

dwarf shrub, sterile;
leaves consistently green
on both sides.

flowers bluish white.

5,500'
8150'

172 1961 Hawaiian Is.

- 41669 *Couzia bonariensis* (L.) Griseb.
rare on open lava slope
1 70 *Geranium carolinianum* var. *montanum* (Benth.) F. & G.
rare on open grazed lava slope
4 71 *Tagetes*
common on grazed ravine walls
3 72 *Myoporum sandwicense*
small grove on high slope
1 73 *Helichrysum*
rare in head of ravine
1 74 *Myoporum sandwicense*
small grove on high slope
1 75 *Veronica plebeja* R. Br.
rare on grazed slope
1 76 March 22 - flat east of Puu
Huualalai
2 76 *Veronica capillifolia* L.
locally abundant in desiccated soil
1 77 Mar. 22 - saddle north of
highest point of Puu Huualalai
1 77 *Styphelia douglasii*
abundant
1 78 Mar. 22 - small cone
north of sheep station, Kaupulehu
1 79 *Gnaphalium japonicum*
rare on bare soil.

Mar. 22 - cones at head of

Kaupulehu lava flow

- 1 79 *Geranium cuneatum* var. *cuneatum*
rare in scrub

Hawaii

173

prostrate.

crest rays white, odor very
strong;
spreading low tree 4 m. tall,
flowers rose purple, very
fragrant.

shrub 3 m. tall;
flowers white, fragrant
prostrate.

2150'
7160'

prostrate, fls. bluish white.

7250'

stiff shrub 1 m. tall,
flowers white

1260'
600'
1470m

5500'

shrub 4-5 m. tall, petals white.

March 28 - about deep pit crater
at head of Kaupulehu lava flow
in mossy ground in
open scrub on gentle slope

- 41630 *Centaurium umbellatum* Gilib.
2 common
1 81 *Saxifrage communis*
occasional
1 82 *Cerastium*
occasional
1 83 *Plantago virginiana*
occasional
2 84 *Henopetalum*
rare in semi shade
4 85 *Eryngium campestre*
common

March 22 - Telephone Relay
Station, Kaupulehu
on & open pahoehoe lava

- 4 86 *Peperomia*
plentiful &
1 87 *Senecio sylvaticus* (negrois?)
very local
1 88 *Galinago paniculata* Fav.
occasional
7 89 *Plectranthus australis* R.Br.
common
1 90 *Aherania avenia*
on crushed lava parking lot

March 22 - slope below Telephone
Relay Station, Kaupulehu

- 1 91 *Euphorbia peplus* L.
locally abundant

5700'
5150'

- flowers pink
flower yellow.
flower white.

low arching stems, rhizome
thick, white, flowers deep purple
roots yellow, acid to taste;
flowers yellow.

2500'

clumps, growing from
thick fleshy, horizontal rhizome;
leaves fleshy.

flowers vary from very pale
lavender to almost blue.
prostrate

7700'

erect, lower parts red.

- March 23 + Kona to Waimea
Jct. of upper & lower road.
Guava brush, small clearings.
Meliis on road banks and etc.
Mango, Persea, bubui etc.
Farms.
Guava brush and pastures.
Views of coastal lava flat
to left. Bubui on it.
Plantings of Grevillea robusta.
Bubui grove more Grevillea
and Eucalyptus.
Pennisetum grasslands with
scattered grevillea.
63.8-4 View of extensive lava flows
on left.
64.4 Kamakialehu forest reserve.
Then Kamakialehu aa flow.
65.5 Grassland with native trees
between 2 aa flows.
Several bupukas, with
Nothotrichium sandwicense
and other dry forest trees
in Pennisetum.
66.7 Fair dry woodland on
both sides of road. - varying
from savanna to open forest,
ever closed in places.
68.6 Forest ends. A thinly grassy aa
flow.
69.1 More dry forest.
Puu Waa Waa in distance on rt.
70.2 Cactus occasional. Good
dry forest and savanna

- 70.7 Abutments of dry forest.
Bauhinia occasional.
Some Grevillea scattered
in it also jacaranda.
Forest ends pasture begins.
Planted Grevillea, much
Opuntia, Melia, some
Jacaranda.
73.5 Then scattered dry forest trees
then an aa flow. with
little vegetation ex. Pennisetum.
Open dry forest and grass
on old aa flow. Much of
this is heliotrope.
View of Marine Res ahead.
Kohala Mt. to left.
74.1 Some Santara mixed with
dry open forest and savanna.
The grass through this
region is almost all Pennisetum.
Forest much lower.
74.7 Forest essentially ends.
Grass with abundant
Opuntia, scattered bupukas.
Then an open scrub of
Scheelea, Santara, Nodones, etc.
with Opuntia.
75.5 gate. Savanna with Cactus on
rt. grass with Cactus on left
Eucalyptus planted on rt.
overgrazed pasture with
Opuntia.
Planting of Eucalyptus.
more pasture.
- 70.8

- 82.0 Mauna Kea to rt. in distance.
Open pasture with scattered
Opuntia, patches of Dodonaea
scrub.
- 82.5 Eucalyptus on rt. pasture
on left with low scrub of
Dodonaea. Dodonaea also in
Eucalyptus.
- 83.5 ^{dry} Dodonaea scrub with some
grass. over large areas. scattered
Opuntia. Some hide fallas.
Some grassy areas, esp. below
road. Pennisetum lacking
here. Badly overgrazed.
- 87.1 Jet. with saddle rd. R. w.
Some patches of scrub still,
esp. about road. Mostly thin
overgrazed grass. Considerable
Opuntia.
Vast level expanse of
pasture
Argemone. hide.

Much Eucalyptus planted
around Waimea.

Fields and green pastures.
Eucalyptus and Monterey Cypress
wind breakers. Honey factory on rt.
Into pasture thru gate. Kikuyu
pasture. Ravines with Rhos
junc. etc on sides. Past reservoir
thru gate. Native forest on rt.
but with Araucaria. Eucalyptus
planted on edges. Cryptomeria
alnus.

Saddle rd., Sphagnum on
steep slope in pasture.
Sporobolus et. dominant in
pasture.

Ridge on left with
~~Cy~~ Lehua forest.

Enter forest gate.
Planted forest. Some
native things. Cibotium.

Opening with Glaucium.
+ brush. Saddle rd. Much
Eupatorium sp. Indigofera
scrub west of Lehua,
Cheirodendron, Cibotium,
Saddle rd. etc.

Eucalyptus along rd.
Low vegetation continues
with less disturbed
appearance to edge of
Waipio Pali. Then even
lower and more depressed
and windswept vegetation
along edge to end of road.
Sphagnum along road.

At end of road small
clearing for turning cars.

This is lined with Saddle rd.
Hillebrandii, Cibotium cf. glaucum
tall shrubs with trembling
leaves Cheirodendron.

On left side (facing Waipio)
Gordonia term. + purpurea
Broussonetia argentea Illicium
Vaccinium calycinum, Myrsin spp.

and Metrosideros. Drier sand along edge of road.

On other side small sphagnum bog, much *hadleria*, *cibotium*, very depressed. Most of same shrubs. *Mitchella* *angustifolia*.

Clammy weedy.

Across ditch at head of valley - edge *Pipturus* ssp. *griseus*, *Dubautia* cf. *plantaginea*, *Fenogynum*, ~~Elatostoma~~ *Clermontia* sp., *Cyperus* just to fit in bank - *Gunnera*, *petaloides* - common down river bank.

Along trail to left

Hypericum japonicum,

Aegopodium sp.

15 m. along. *Cyperus* sp. wethead on bank. *Nertera granadensis* creeping on mossy bank.

Sphagnum line banks of small watercourses. *Cladonia* on rocks. *Vermicaria globosa* on rocks and bank.

Patch of *Hedycium* -

Boggy low scrub away from ditch - low metrosideros
Ciptium cf. *glaucescens*
Athyrium cf. *pinnatum*
Carex cf. *sandwicensis*
Elaphoglossum glaucum
hadleria bellbrunetii
Peperomia sp.

Nertera

Hymenophyllum revolutum

Thelypteris

Lycopodium caninum

Agrostis sp.

Vaccinium cal.

Pelea cf. *clusiæfolia*

- *Hypenemum*

Lucus sp.

Magnolia cf. *lanceolata*

Alyssum

Juncus sp.

Chenopodium

haccidolepis

dry soil -

Flex anomala sp.

Chenopodium "

Zonellia

Thysanandra

Opanophagnum

Lomatobelia - dry

Turpinetia (was in dry soil)

Sachana distichophyllo

Marsilea angust.

Edge of cliff
Gaultheria shallon
Bromus
Cibotium
Magnolia sanderi
Magnolia lacerata
Gaultheria tenuis
Cyperus
Metrosideros
Chirodendron
Diospyros
Lobelia
Cibotium
Ladleya
Athyrium
Pilea chrysophylla
Clermontia
Dubautia
Spiraea
Grindelia
Rubus sandwicense

Between small ridges can
 be seen a bog or a roadside, Jan.
 Trail along ditch from
 2 bridges -
Cibotium menziesii
Clermontia
Rubus

The low vegetation, in
 general, is dominated by
Metrosideros, but with
 abundant emergents of
Chirodendron. *Ilex* unknown.

General height 1-1.5 m.
 Emergent to 2.5
 Pig rooting everywhere.

Ravines - taller veg.

Forest taller away from
 pali.

02.7 On way back -
 scrub in open country well
 south of saddle Road Jet.
 is about 30% *Dodonaea*
 20% *Withania* with
 a little *Ficus pallida*.
Tricholaena rosea
 fine yellow red ash soil,
 but rather thin.
 0.6-1 m. tall. a few
 other weeds *Diospyros*,
Verbena etc. *Opuntia*, etc.
Waltheria, none numerically
 important.

11.0 well developed dry forest.

Most of the dry forest here
 seems a mixture of *Metrosideros*
 and *Diospyros*.
Reynoldia (mehai.)

" (mehai)
Dracocarpus (mehai)
Erythrina, etc. (mehai)

- 18.4 many *Reynoldia*
 18.7 interesting forest
 - 19.0
 20.1 *Nyctothelium*
 20.9-21.0 " "
 22.2 lava flow.
 lava river with spatter-rope.
 23.6-8. rich forest, *Nyctothelium*, *Festuca*,
 24.7 1201 flow.

sambucus around many
 of houses in towns. medicinal?

- 30.0 Jet. Hololua - Kaihue rd.
 32.3 *Reynoldia* in sick area mds.
 33.9 Jet. with Volcan Rd above Kaihue.

Thick ^{& open} *Prosopis* forest.
 locally *Acacia* with *Prosopis*
 and locally, with *Lavandula*.

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1961 Hawaiian Is.

Mar. 23 - Waimea-Koa Road
opposite Puu Waawaa41692 *Santalum ellipticum* var. *holgeri*
Dry open forest on aa lavaMar. 23 - head of Alakahi gorge
Kohala Mts.in low shrubby vegetation
near edge of cliff93 *Mysore sandwicensis*

common

94 *Pelea ciliataefolia* A. Gray. ^{not sp.} ~~in sp.~~ cooleana (Rock) Stor

occasional

95 *Lobelia*~~spp~~95 *Gouldia hillebrandii* var.

occasional

96 *Coprosma pubens* Gray

occasional

97 *Gouldia terminalis* var. *purpurea* Forst

common

98 *Hedychium gardnerianum* (Lindley)

occasional

~~Gardenia~~ ~~Heo~~98 *Stenogyne*

occasional

99 *Pipturus albidus* (H. & A.) Gray var.

common

100 *Cyanella*

occasional

101 *Clermontia*

rare

Hawaii

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600 m.

shrub 2 m. tall, leaves
yellow-green, glossy above,
flowers green, yellowish
within, fragrant.

1800 m.

shrub 1.5 m. tall; fruit black.

cooleana (Rock) Stor

shrub 1.5 m tall, buds green.

♀

shrub 2 m. tall, flowers
green, ripe fruit black.shrub 2 m. tall; flowers
greenish.

shrub 2 m tall.

woody scrambling

vine; flowers curved, deep purple.

shrub 1.5 m. tall; leaves
stiff, rugose, main
nerves red beneath.

last few, shrub 1.5 m. tall, flower buds

purple; fruit orange, soft.

shrub 1.5 m. tall, petals and
sepals black-marrow

188

1961 Hawaiian Is.

- same - on moist earth cut above ditch.
- 41702 (grass) *Deschampsia nubigena* Hbl. s.l.
abundant
- 1 03 *Cyperus papyrus* Rottb
common
- 1 04 *Nertera granadensis* v. *insularis*
occasional
- same - in low boggy vegetation on flats back from cliff edge.
- 4 05 *Carex*
abundant
- 2 06 *Clermontia*
~~stands~~ rare
- 4 07 *Chirodendron tricuspidatum* (Lam.) Hill
very common
- 4 08 *Vaccinium calycinum* var.?
common
- 2 09 *Athyrium microphyllum* (Lam.) Baker
common J.W. Johnson 8/96
- 1 10 *Thelypteris*
rare
- same - in Sphagnum bog
- 1 11 *Fobelia lyngbyacea*
rare
- 1 12 *Fobelia*
rare
- 1 13 *Scleranthis*
very local
- 2 13 *Sphagnum*
abundant

Hawaii

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Hawaii

prostrate, closely clinging to earth; fruit orange.

- ~~small~~ tufts of a number of stems.
lactiferous shrub 1.5 m. tall,
corolla & calyx blackish
maroon within.
- shrub ~~3 m.~~ 3 m. tall,
aromatic; fruits maroon.
- shrub, m. tall; leaves
somewhat glaucous beneath;
fruit red when ripe, glossy.
rhizome erect,
fronds translucent

lactiferous
shrub, sparsely branched,
sterile,
dead fruiting plant.

~~infected~~

forming deep pale green cushion.

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(56) Hawaiian Is.

41714 (grass) *Deschampsia nutigena* Hbd.
abundant ~~at~~ 5.!

- same - in eroded boggy
slope where clay is exposed
- 4 15 *Elettaria obtusa* (Willd.) Schults
very local
- 6 16 *Sugata Janus planifolius* R. Br.
common
- 2 17 *Juncus bufonius*
occasional

Mar. 23 - 2 mi. s. of junction
of Waimea-Kona Road with
Saddle Road
in low scrub in overgrazed
pasture

- 4 18 *Sida*
common
- 3 19 *Wikstroemia*
very common
- 3 20 *Dodonaea viscosa*
abundant, dominant
- 7 21 *Wikstroemia*
very common
- 7 22 *Dodonaea viscosa*
abundant, dominant

Hawaii

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800m.

- tufted
- tufted
- small tuft.
- shrubs 0.3 - 0.4 m. tall.
- shrub 0.7 m. tall; fruit red.
- shrub 0.8 m. tall.
- shrub 0.5 m. tall, fruiting
abundantly, fruit red, globose.
(only a few plants with
abundant fruit).
- shrub 0.9 m. tall.

March 24 - Kealebahuu

Sambucus is generally planted around small houses, just as in Colombia, etc.

Mar. 24 - Kailua - Hilo via saddle.

60.1592

Kailua - Hilo - Kamuela - airport jet
ornamentals.

Kiaue - like thickets, with *Leucanea*,
on gentle lower flow slopes. *Sauvagea*
common in upper part.

61.7 Old sisal plantation / *Ryynoldia*
Tree manka at about 62.) to 62.7

Farms, guava thickets, coffee, etc.
breadfruit trees on left.

jet. with upper rd.

Balsa tree on rt a bit away from rd.

black lava flows down, flats to left.

Grevillea planting.

Kamuela Forest Reserve gate.

Thicket of *Nothotrichium sandwicense* just below road.
with trees of *Diospyros ferruginea*
around ~~the~~ rt.

Bright green, small leaf. trees
are *Canthium*.

slightly to right and 10-15 m.
below road a tree of *Kohia*.

Just above road, inside gate,
Chenopodium oahuense. 2.5 m.

To left, just inside gate,
Santalum. Just above this,
a sizeable bush of *Ostrolenes*.
Chenopodium general in

undergrowth. *Cyperus trachysanthos* and a
narrow-lefd form of
Cocculus in grass here.
grass is *Pennisetum*.

straight up slope
on left a tree of *Colubrina oppositifolia*, with a
slender one of *Nothocestrum*
and one of *Santalum*.
Sida gallica shrub.
Much *Diospyros*.

On rt. a fine *Colubrina*,
and around a boulder
in center *Canavalia galeata*.

Red mint is *Salvia coccinea*.

small blue one *Plectranthus Peperomia* sp. with it on bare rock.
Santalum common.

Above left hand *Santalum*
another *Nothocestrum*

Circling to left we find
slender *Sophora* and
a large tree of *Pouteria* sp.
above it *Canthium*
a thicket of *Sida*.

Trees of *Diospyros* parasitized
by *Korthalsella*.

Asplenium trichomanes
in rocks. *Sicyos* sp. on
rocks in open spots.

Folig planted.

2 forms of *Cocculus*
one with emarginate petals.

weeds
Solanum nigrum
Physalis peruviana
Paspalum fontoides
Lantana camara
Cocculus
Euphorbia peplus
Salvia coccinea
Pennisetum impalense
Syzygium alleastrum
~~Chenopodium~~
 ? *Muntingia calabura*
 ? *Momordica charantia*
 sides ^{balsamino} *Ficellaria medio*
 nilos ^{lanceolata} *Cupressus loddigesii* sp. (planted)
~~nilos~~ *Ophiadenus* sp.
~~nilos~~ *Emilia sonchifolia*
~~nilos~~ *Conyza bonariensis*
 Anos, just below fence
~~Kohia~~
~~Dracaena aurea~~
~~Osmanthus sandwicensis~~
~~Pellaea~~
~~Nephrolepis cordifolia~~
~~Argemone glauca~~ var. (smooth buds)
 photos of Kohia and vol 7, first
 of vol 9 (1st & over esp. 2)
 photos of general aspect,
 of argemone. more of gen aspect.
 lower st. corner
~~Xylosteum ham.~~?
~~Cyperochaeta~~
~~Dromaeocarpus~~
~~Indigofera~~
Hibiscadelphus hualalaiensis planted

195
 Below rd green tree border
 with pendulous bits. Xylosteum
 tall brownish one Pontea,
 lower greenish brown one,
 Colubrina.
 Plumbago zeylanica beneath
 also a Dracaena.
 Lantana abundant but
 in bad shape.
 25.0 *Crypsinus* grove maula
 with abundant *Crypsinus*
 also *Isopogon*, *Canthium*,
Sophora, *Myoporum*,
 some *Nothocentrum*,
~~Dracaena~~ *Nototrichium*,
 1. *Reynoldia* tree + 200 m.
 maula
 Cattle have been
 doing considerable damage.
 no seedlings or very young
 trees.
 Photos of everything
 and general aspect. finish
 vol 7.
 78.6 grove of *Reynoldia* maula.
 79.0 photos of Pua Waa Waa + in
 other directions - dry forest.
 Punaauia school
 81.1 1359 blow.
 Then a good patch of
 open dry forest. largely

- Metrosideros and *Diospyros*
but some other native species
still get lower northward
to just beyond Pua
(at 950') where it fades
out into grassland and
Solanaceae scrub. Last tree
are *Sophora*.
- 85.8 Cross section of crater cone on rt.
- 87.3 Jet saddle Rd.
Bare under cone to rt.
Mainly *Solanaceae* scrub
some *Spiraea*, some open grass
with more or less *Spiraea*.
Patchy, more scrub than
grass lower down, grass
increasing upward.
patches of scrub rather sparse
Eucalyptus planting on left,
to 98.9. Then grass. Is more
scrub. Pasture of *Sporobolus*
elongatus.
- 99.4 Patch of *Eucalyptus* on rt.
Patch of *Cupressus macrocarpa*
- 400.2 and rows of *Eucalyptus*
dealbata, *Cupressus*,
Eucalyptus etc. Ranch bldgs left. (Waikiki)
- 003-8 Windbreaks of *Eucalyptus*.
Pasture land.
- 02.3 Old cone with crater to rt. (bare)
Remnant of *Sophora* forest to left.
more scattered *Sophora*.
- 2.9 *Myoporum* + some *Sophora*, scattered
- 3.4
- 4.7

- scrub in watercourse. a little
Solanaceae.
Wooded cone to left, some
bare over ahead.
- 5.2 Mauna Kea ahead, Hualalai
to rt.
- 5.8 Mauna Kea to left.
Grassing area. (*Poaahuoa*)
grass much more luxuriant,
more *Solanaceae*. A little *Sophora*
and *Myoporum*.
- 6.2 *Chenopodium* common. Land
badly torn up by heavy
military equipment.
- 7.2 Cones ~~on~~ on Mauna Kea slope
to left fairly well wooded.
Here scrappy veg. of *Chenopodium*,
Myoporum, *Sophora*,
Pouteria scattered in
treacherous grassland.
- Cones in all directions.
- 09.2 (39 mi. to Hilo) Pau Kohi
Chenopodium scrub, open,
badly beaten up.
- 10.0 Pines of ash.
- A definite belt of scrub
part way up Mauna Kea
on left. Grassy slope below,
bare (or grassy) above.
belt is about $\frac{1}{4}$ to $\frac{1}{2}$ the
width of slope, but
becomes broader ahead
until it reaches down to
level of saddle at military camp.

- 14.2.7 Poherulox along road.
above this open Sophora
Myoporum woodland with
~~and~~ Chenopodium and
tussock grass.
- 13.7 Hunting Lodge and picnic
ground
Woodland horribly beaten
up by manouvering.
- 14.3 ^{base} aa or right, thin
on left that on left over,
covered by scattered bushes
and Myoporum with Chenopd.
- 15.4 New aa below ^(19.3) no vegetation.
In isolation to left some far
Sophora - Myoporum pred.
- 16.9 Good Sophora - Myoporum
- 18.6 forest just to left across aa.
- 17.4-18.6 ^{17.4} Pahoehoe flow on rt. across aa.
- 18.7 Hill with Myoporum - Sibelia
on left, poor condition.
- 19.0 highest point - aa field.
- 19.1 Badly damaged Sibelia My. pred
19.9 Pahoehoe field. to left.
- 21.0 Humulus sheep st. on left,
Pun Haluhulu on rt.
- Forest on Pun Haluhulu badly
damaged by grazing.*
- Myoporum*
Coprosma
Sophora
Acacia koa
Styphelia
Rubus macraei
Metrosideros徒道树
- photographs of pun haluhulu + of mānaea*

The grassy veg is completely
weeds:

Rumex acetosella
Ceratium vulgatum
Festuca myuros
Brownia rigidus
Geranium carolinianum
Poa compressa
Brownia sp.
fondue, olacocoma cf. awenis?
stellaria media
Pteridium
Lapsana
Paraxacum vulgare
Hypochaeris radicata
Bidens pilosa var.
Ludwigia palustris
Epilobium
Brownia cathartica, amabilis
Physalis peruviana
Hypochaeris glabra
Lepidium virginicum
Anthocephalum odoratum
kids toward Mānaea Hea
grassy with a few Myoporum
Sophora Coprosma. Top also.
Other side has forest with
much lowroma, a little
lehua, some Myoporum. A few
bushes Styphelia (tall) and patches
of Rubus over.

Around base a bit of
Styphelia comb. + Coprosma
Brownia argenteum on
cinders along rd.

19 200

- Pahoehoe flat toward hills.
aa on left side with
low lehua woodland.
fresh aa field.
- Complicated pattern of
aa, pahoehoe, and old
flows with low scrub
on flat in saddle.
- Degraded forest to left,
grazed.
- Fresh flows along rd.
for some distance. Then
many small lehua
with small lehua and
low scrub or dwarf scrub.
Lichens abundant on
aa flows.
- Pahoehoe with licheny ferns.
Then more aa with lichen.
Dwarf scrub on left.
- Lehua forest across flows to rt.
lehua forest on left.
- More and more veg. on aa
lichens very thick. Sadleria,
Cepha. erinod. Polypot. fel.
lehua (small) Vaccinium.
- 30.0 (19 mi hills) Small lehua, 1-2 m.
common. ferns more and
more abundant.
Few open forest
- Patches of taller forest on rt.
More and more tall forest.
Bon forest more and more
developed.
- Gleichenia. Tall forest on rt.

- 33.0 Mosaic of low open and
tall, rather dense forest.
- 33.5 Open low forest with
gleichenia + sedelia
This far some miles.
- 35.0 Stop. Open scrub + forest
of lehua 2-4 m. tall, with
gleichenia, hypopodium cernuum,
Machaerina angustifolia,
Cepha. ^{and} htypothelia
Lasioblepharis ^{contr} (var) Vaccinium ret.?
Cepha. erinod. epiphyllum ^{contr} (var)
In places the Machaerina
is dominant in ground layer,
in places Gleichenia.
- Hedysarum glomerata
Sadleria cyathoides
Dubautia scabra (?)
Hypochaeris radicata (in trail)
- On rocky pahoehoe. Covers
ground completely.
(14.2 mi. above hills) Small
back off place on rt. + trail
into wood.
- Taller forest on left.)
37. Tall dense lehua forest with
well developed lobelia large n left.
then lower, tangled with
gleichenia.
- 37.1 Open fern-machaerina with
scattered lehua. Andropogon along rd.
Thickets up farther down. low bro.

send booklet

Dwight E. Walker
Pahoa, Hawaii

Wailand or arabi
Pentas

41.0 - cleared & regrowth
patches of lehua. patches of
fern lehua. mostly open
degraded forest or open scrub.

42.1 *Rhus javanica* on left.
Macraeiina with scattered
small lehua.

42.4 Melastome.

43.2 fruit house.
dense small lehua on left,
open with *Glaucium* &
macraeiina on it.

43.8 Thickets of small lehua
and *Glaucium*.

44.2 (Hilo outskirts) Kauwana

45 Cane on old grass bank at
Kauwana below
cane fields

45.4) Kauwana lava. Lehua dense but

955 973 125 cane field, grass ^{small} thickets
fern lehua, farms.

46. Houses.

